THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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H. Alabaster, Gatehouse & Co., 4, Ludgate Hill, London, E.C

BUSINESS AS USUAL.

IT is difficult for the most strenuous advocate of the doctrine, "Business as Usual," to prevent his thoughts from wandering to the great War which is at present convulsing Europe.

And this is well; for when he is trying to devote one part of his mind to his business, and another to the fortunes of British soldiers in the field, he must inevitably be led to consider what is meant by the phrase: "Business as Usual." It was written of old that "to the solid ground of Nature looks the hand that builds for aye"! And so, war being an essentially natural phenomenon, it is not unprofitable even for the man of business to consider it from various points of view.

In the application of the maxim which heads this column, it is essential to remember that this is a *race* war. It might almost be said, without any disrespect to the gallant Allies of this country, that it is a race war between Teuton and Anglo-Saxon. Which shall survive? On August 4th, 1914, the English happened to be in possession of a considerable portion of the more attractive parts of the earth's surface. As a wit was once heard to say, "We came by many of our Colonies in a fit of absentmindedness," but there they are. We are the men in possession. Your twentieth century Teuton says: "True, you Britons are in possession; but let those that have, hold on, if they can."

How, then, if the Germans are going to dispute our title to our possessions, our claim to be rulers of the waves; if they are going to make war against our trade and our commerce in every quarter of the globe, can we afford to conduct our business as usual? Must not millions of British soldiers be ready to meet and slay the legions of the Kaiser? Upon hearing that the manhood of Germany is going to take the field, your armchair alarmist, who is unbiassed by any knowledge of military affairs, is heard to exclaim: "Every Briton capable of bearing arms (except me) should enlist at once."

It is only when one grasps certain fundamental points about the present war that the necessity, the vital necessity, for keeping our industries, or a large number of industries, going on as usual is forced upon our minds.

In the first place, all that is involved in the word *army* is not to be found in the battalions drawn up for inspection. In addition to the Reserves, there is much else to be thought of besides the number of men who are able to take their places in the fighting line. Equipment and reserves of equipment have to be provided. Arms and ammunition have to be supplied, and in these days of the application of science, and in particular of the application of electricity to the needs of warfare, scientific instruments have to be made in enormous numbers, and at enormous speed.

Your amateur strategist who talks airily of an army of a million men forgets the numerous factories which must be kept going if that army is to appear as an efficient fighting force. He is heard to complain of the bad recruiting in certain industrial centres; but he forgets, nay, he never had the wit to realise, that the man who is working 10 hours a day in blue jeans, at lathe or forge, is often serving his

King and country just as well as the man in khaki who is wallowing in the mud of Flanders!

It has been said: "You cannot improvise an army!" The truth of this statement is realised when one appreciates (in the light of what we have said above) the real meaning of the word "army." The private soldier can be trained in a comparatively short period of time; but arms and equipment cannot be conjured up from nowhere. Nor can your "soldier of industry" be improvised. He must be trained, and it takes years from his youth up to make him efficient. To empty the engineering workshops of England at this moment—to allow skilled fitters and mechanics to enlist in the ranks—would endanger the safety of the country in a marked degree.

Another consideration forces itself upon the mind. Although the Germans have called many million men to arms they are still, in one sense, carrying on business as usual. We say this because, for the last 30 or 40 years, preparation for war has been part of the business of the subjects of the Kaiser. They have invested large sums in arms and armament, and in ships; the War Council has expended a large proportion of the vital force of the male population in training youths to arms. For all this expenditure they expect something in return. They expect (or at any rate did at one time expect) to get that return as a result of the present war.

In these circumstances it is necessary for English people to realise the necessity for "business as usual;" and business as usual is not incompatible with sufficient recruiting. It is safe to say that the industry with which this journal is primarily concerned renders most valuable services to the War Office, as well as to the Admiralty. Were our electrical engineering shops shut down through skilled mechanics being called away to the War, there would be panic in Whitehall.

We assert, therefore, that the manager who knows the qualities of his men may be doing a positive disservice to his country if he encourages those who can exercise high mechanical skill to join the Army. The pity of the voluntary system is that it is the most intelligent who are most obedient to the call of patriotism. The cream of the industrial population is skimmed off; the worthless are left behind. The hefty village loafer—the kind of man who is capable but lazy—views the greatest war of all time with supreme indifference. As he watches the battalions of recruits march by to the tune of "Tipperary," he comforts himself with the reflection: "Even if they are killed, and even if the British Army is wholly annihilated, there will still be a public-house for me to lean up against"!

To bring pressure to bear on the strong and healthy labouring classes to join the army is clearly the duty of everyone; but to keep in full swing the industries of the country, particularly those industries which are of primary importance to the naval and military authorities, and thus to carry on business as usual is also an urgent necessity.

Copper.

THERE has been a very strong tendency in the copper market lately, and the extent of the upward movement which has been seen has taken people here quite by surprise. There is no doubt that the worst points of the depression arising from the war have been passed now, but nobody was prepared to find prices soaring skywards as they have been doing of late. The main impulse of the rise came from the United States. There, there has been a continual grumbling by the German-American copper interests, who found that the action of Great Britain and France in declaring copper contraband had had the effect of shutting off their export trade to their friends the Huns. A lot of nonsense was talked by them as to the ill-effects of the contraband declaration upon the United States copper trade, disregarding the patent fact that it was the financial position created by the war which hit American industry as it hit industry in all neutral countries. A sort of grievance was thus set up, and pressure was brought to bear in America to have the British pulled up for interfering with ships carrying copper to "neutrals." The point that the said neutrals were taking huge quantities of copper, which under no possible combination of circumstances could they consume legitimately in the usual way of their trade, was glibly passed over, but American-German opinion is strongly in favour of the British attitude being materially modified, with a resulting large increase in the American copper exports to Germany by way of neutral countries.

Some flagrant cases of smuggling have been detected, and what with the United States Government concealing details of shipments in order to assist the contraband trade, and the issuing of fraudulent manifests and the concealing of copper in bales of cotton and under grain cargoes, it will be seen that the British Government have a very good defence to any action they may have taken to put a stop to illicit shipments of copper. It is hardly to be supposed under these circumstances that the safety of ourselves and our Allies is going to be imperilled by too tender-hearted a regard for the German-American copper millionaires who are now squealing. It is to be hoped not, at all events. It is very curious how these people change their tune. When complaining of the wicked British Navy in stopping their tricks they whine in the usual way, but the next minute tell the newspapers, as Mr. Vogelstein did a few days ago, that the copper shortage in Germany "is not going to have any bearing upon the war. Without denying the fact that the cutting off of supplies of copper is annoying to the highly developed German industry, it is of minor importance to the Germany army and navy. Germany is merely annoyed without being hurt." It is a very different tale, however, which this German-American tells in official circles.

The interim reply of Sir Edward Grey to the Note of the United States contains some very instructive figures, which fully bear out what has been stated in this column from time to time with reference to the rate at which the United States has entered the contraband business. Sir Edward recites the official details given by the United States of the copper exports from that country, showing that for the months during which the war has been in progress up to the end of the first three weeks of December, the exports were 36¼ million lb. against only 15¼ million lb. in the same period of the previous year. Norway, Sweden, Denmark, and Switzerland are not shown separately in the returns, but are included in the heading: "Other Europe." Under this heading the figures for last year are 35⅜ million lb., and for 1913 only 7¼ million lb. It is very justly pointed out that the presumption is strong that the bulk of the copper recently consigned to those countries has been intended not for their own use, but for that of a belligerent who cannot import direct. Under these circumstances, the British Government cannot be expected to abate their efforts to put a stop to the contraband trade in copper.

With America buying warrant copper and producers pushing up their prices in New York, there has been a sharp advance, but prices really look quite high enough. Trade buying is quiet, but general consumption is fully as good as can be expected.

Manufacturing Ability of British Electrical Firms.

WE have received a letter from one of the largest British electrical manufacturing firms regarding certain statements which appeared in the article on "We Can't take the Risk," published in the ELECTRICAL REVIEW for December 25th, 1914. The firm in question express their desire to demonstrate to "R.S.T.V.," the writer of the article, or to anybody else who may be in the market, that the time mentioned by him for the delivery of a 10-H.P. motor is far from representing the present ability of British manufacturers. The firm's own position is that they can meet such a requirement, and any others in reason, in a considerably less period. They feel that, though "R.S.T.V.'s" statement may not have been intended to cast a reflection upon the ability of electrical manufacturing firms in Great Britain readily to supply electrical apparatus, it is likely to have that effect unless it be understood that the writer

of the article was merely expressing an individual opinion, and one which, though it might correctly apply to one particular case, cannot be applied generally. We ought, perhaps, to say that we have ascertained that "R.S.T.V." was not personally a buyer of motors. We hope that our readers, both at home and in the Colonies, have gathered from our editorial comments on the position as it has developed since the outbreak of the war, that though our factories are necessarily engaged upon a good deal of Government work, they have in a number of cases adopted measures which will prevent delay in the execution of ordinary electrical business. Any impression, such as gained currency in some parts of the world some months ago, that foreign buyers could not depend upon British works promptly to fill electrical orders, is entirely erroneous. We repeat the appeal to Colonial and foreign buyers that we made in the early weeks of the war, to continue to keep a welcome stream of orders for all classes of manufactures flowing into this country.

Censorships of Cable Telegrams.

THE *Daily Chronicle*, on the 9th inst., published an article on "Cables and Commerce: How to Kill the Enemy's Trade," and therein gave it as its opinion that some slackness was shown by cable censors, and that the Government should take possession of the cables as they had done in the case of the railways and wireless stations. It was an easy matter for the Government to take charge of the wireless stations in this country, as they are all British-owned, but the case of the Atlantic cables is far different, they being now the property of and controlled by American companies, who, to judge by recent experience, would quickly obtain the aid of their Government in the righting of any grievance. It seems to us that the greatest danger to the country from a telegraphic point of view is not so much the manner in which the censors perform their duties—we believe they are manfully striving to do their best in a very difficult and complex matter—but the ability of our enemies to conduct their telegraphic correspondence as usual through the media of contiguous neutral countries and the cables landing on our shores. Telegrams, like copper or other commodities, should be treated as contraband and confiscated where there is reasonable belief that they are intended for purposes inimical to our country's interests. In this respect, telegrams passing to and from Holland, Norway, Sweden, Denmark, Italy, Spain, Switzerland and Monaco should be specially scrutinised. It must be evident that if, as reported, the trade of countries washed by the North Sea has so grown that shipping facilities have had to be largely increased, a growth of telegraphic business is bound to occur, and what is the use of having the largest and widest telegraphic system if steps cannot be effectively taken to neutralise the efforts of individuals to profit from the disasters of the war and to our detriment?

We have been informed that the Atlantic cable companies' figures for traffic from Scandinavia have increased to a very large extent, and this goes to prove our contentions above set forth. If necessary, the cables landing on our East Coast should be closed during the war, lest messages should be forwarded to countries from whence supplies are largely obtained, intended for ultimate use by our enemies. There appears to be little use in clearing the seas of hostile fleets if trade with our enemies is to proceed unhampered; every effort should be directed towards diverting trade to Great Britain, and making her the entrepot for supplies, the re-export of which to neutral countries could be then efficiently ordered, and the incidental profits would be earned by those whose resources are being so largely called upon to rid the world of militarism, and to establish conditions making for a lasting peace, conferring benefits on humanity at large. In conclusion, we may say that centralisation of all censorship at the Central Telegraph Office would not, in our opinion, increase efficiency, and the incompetence or slackness of any one censor, if it existed, would not be overcome. In fact, we think confusion would arise, as the number of commercial and private telegrams to be dealt with is far in excess of the number of Press telegrams, and the centralisation of work in connection with the latter is, therefore, an easy matter.

South African Winding Accidents.

IN an article commenting on the occurrence of a serious winding accident recently, our contemporary, the *South African Mining Journal*, mentions that there were in 1913 in the Transvaal 81 overwinds or runaways, and that in 13 cases death or injury resulted. Of these overwinds, &c., 30 occurred with electrical hoists, and it would be instructive to learn how far they were responsible for the casualties mentioned. The causes of Rand overwinds have been most carefully considered by the Mines Department, and it has been found that, apart from accidents due to failure or beakage of plant, at least five distinct classes exist attributable mainly to carelessness. Most of the causes cited should not (and may not) apply to electric winders, in view of the automatic safeguards provided, but Class IV: Lowering unbalanced with electric winder on counter-current, too great speed developed, or too sudden application of reverse current, failure of resistance control of rotor, tripping of switch of stator circuit and failure of single brake to control runaway drum, may be of interest to those who are studying the electric winding problem in this country.

Swiss Engineering and the War.

A TYPICAL illustration of the manner in which a country that is not directly affected by the war may be indirectly involved in some of its consequences is afforded by the case of Switzerland, which was compelled in its own defensive interests to mobilise on the opening of the war, and subsequently to recall its Reservists from different countries, including Great Britain. How the engineering trade was concerned will be understood from the report issued in December by the directors of the Oerlikon Maschinenfabrik, which may be accepted as a representative example of the conditions which prevailed in the case of all engineering works in that country. The report states that, owing to the mobilisation of the Army, more than one-half of the workmen and officials were called up for service. It was no longer possible for the workshops to effect deliveries, as every working organisation was broken up. The receipt of new orders was brought to a complete standstill, and the forwarding of finished manufactures, as well as the supply of raw materials, almost entirely stopped. Nevertheless, and as a consequence of the large stock of orders, it was possible to maintain working operations without interruption, although with a reduced staff. In the meantime, a slight improvement has taken place in the arrival of orders, although concern as to the future has not yet been overcome. The directors do not mention the fact that a number of workers have been temporarily released from field service in order to resume their normal occupations, so that, for the time being, the supply of labour should now be more favourable than in the first two or three months of the war.

The Loss of the "Formidable."

A GOOD deal of mystery has been made of the communication of news of the sinking of the *Formidable* to Germany by the submarine which is alleged to have caused her loss, and it is suggested in the daily Press that the news must have been forwarded by agents of the enemy within our coasts. Sir Oliver Lodge, in a letter to the *Times*, goes even further, stating that "the public should not suppose that an aerial erection is necessary to wireless signalling; nor need every kind of message be perceptible to adjacent ships. The enemy nation knows at least as much as we do about the

applications of science, and has had forethought in employing them." We do not know exactly what suggestion is intended to be conveyed by Sir Oliver's remarks ; is it possible that he is referring to the telepathic methods of communication in which he is known to be so deeply interested ? Glendower claimed that he could "call spirits from the vasty deep," but Hotspur questioned whether they would come when called, and we really doubt whether the Germans, in spite of their proclivity to Satanic methods, are so closely in league with the nether world as to possess supernatural means of communication.

But there is no need of mystery. The disaster took place at 2 a.m. on January 1st, whereas the German communiqué was dated January 3rd. Mr. P. A. Hislam, in the *Globe*, points out that, assuming that the news was received at Ostend, the nearest German base on the coast, as early as 3 p.m. on January 3rd, the submarine had 60 hours in which to traverse a distance of 200 miles, bringing her within 100 miles of Ostend, at which distance no doubt she could deliver the message. That is to say that she need only travel at an average speed of 3½ miles an hour to effect her purpose. If, on the other hand, the news had been transmitted through this country, it would probably have been received in Germany on New Year's Day.

The foregoing is based upon the Admiralty statement that the disaster was due to a submarine, and not to a mine ; but when the conditions are considered—a stormy sea, the ship travelling at 16 knots, and no light but fitful moonlight — it is difficult to believe that any submarine could accomplish the apparently impossible feat of striking the ship twice. It seems more probable that the disaster was due to mines, and that the German claim that it was caused by a submarine was merely bluff.

TECHNICAL TEACHING AS A PROFESSION.

By A TEACHER.

During the last 20 years or so a new profession has been gradually rising in these islands, that of technical teaching, and the purpose of this article is to indicate the opportunities and scope it offers to young men who may think they have a liking for this class of work, as well as to state frankly the disadvantages connected with it. The whole subject is quite modern, for it has grown up naturally with the rise of technical schools and institutes in our midst ; furthermore, as such schools and institutes are still being equipped in ever-increasing numbers in all parts of the country, there is likely to be increased scope in the future.

The chief departments into which technical teaching, as a whole, is divided, are Engineering, Physics, Chemistry, and Textiles. There are subsidiary departments such as Mathematics and various trade classes, but the four abovementioned form the nucleus round which the others move and have their being. Technical teachers, therefore, usually belong to one of the four. The subsidiary classes are often in charge of instructors who during the day are carrying on their ordinary duties in the workshop or factory, and who are paid so much for a couple of hours twice or thrice a week—such occasional teachers being under the discipline of one of the heads of the four main departments.

The Institutes where teaching of a technical nature is carried on are many and varied. The large cities possess their great schools, specially equipped with the latest and best types of experimental machinery and apparatus, while the smaller towns and even villages have their necessarily more limited and circumscribed centres ; and the character of the teaching of course varies with the size and importance of the Institute. In such great schools as those of Manchester and Glasgow, for instance, all kinds of day work are carried on, some of it advanced and of University standard. In the smaller places, however, day work is not an important feature. And even in the largest and best of our schools, the instruction given to evening students holds first place ; indeed, it is because of, and for, evening students that the technical school may be said to justify its existence.

The man who desires to take up technical teaching as a profession is in for a pretty laborious time. There is plenty of work and very little play. If we take as an example the case of an engineering instructor, we find that the training this man will have to undergo may be outlined as follows :—

(*a*) Good elementary education.

(*b*) Good secondary education.

(*c*) Apprenticeship of five years or so in an engineering works.

(*d*) University or equivalent training in the science and theory of engineering.

A University, or equivalent, degree is essential, and for the most part the former is insisted upon nowadays. It is true there are ways and means of evading the spending of three years at the University, such as taking an external degree, or winning a Whitworth Exhibition or Scholarship ; but these are not in the direct line of advance, so to speak, and in general necessitate a terrible time of stress for the successful man. Actual experience in teaching is only obtained after the candidate has secured a position. Perhaps it is just as well. Any theoretical course of teaching in the technical line is, in my opinion, useless and unnecessary. The types of students under instruction are, as a rule, anything but homogeneous as regards their previous knowledge and training, and the teacher has to adapt his methods to each. If he has the gift for this work, he picks it up in the easiest and most natural manner, and if he has not, he can never, no matter how much he tries, be much of a success.

When the candidate has undergone the essential preliminary training, he is ready to take up the first suitable position that offers.

The salaries and the emoluments, as well as the capacities of these positions, vary greatly. The smaller technical schools offer from £200 to £250 per annum to the head of a department, and from £120 to £150 to a subsidiary teacher. The largest Institutes give from £500 to £700 to the head, and from £300 downwards to the other instructors. The principals also receive salaries commensurate with the size and importance of the school ; in a few cases up to £1,000 a year is paid, and in the case of the smallest places down to £200. After some years spent in teaching, a technical instructor may take an opportunity presenting itself of becoming the principal of one of the smaller schools, where he will most likely have to combine a lot of organising work with a certain amount of teaching. Principals in the larger schools seldom do much teaching, their time being usually fully occupied with matters of business detail.

Occasionally a teacher may have the opportunity of leaving the technical school for the University, and may in time rise to a Professorship there, but these cases are necessarily limited. Opportunities of going to the Colonies and Dominions also present themselves from time to time, and there is some competition for such positions, because the salaries offered are often more substantial than those ruling at home.

There is also the chance of becoming an Inspector under the Board of Education, where remuneration for the higher grade work commences at about £400, and rises yearly. Then there are by-ways into which the technical teacher may either accidentally or purposely enter. He may go to India or to China and teach elementary stuff to the natives there ; he may write technical books ; he may, if he can find the time, go in for research or invent apparatus for experimental work ; he may review for the technical Press, and so on.

It should be clearly stated that, like other forms of teaching, technical instruction offers little chance of a fortune to the man desirous of taking it up. At best, a comfortable living is indicated, and in the lower positions, that is to say, for three-quarters of those engaged in it, a bare living only. The work is exacting. Nine teachers out of ten are required to teach at least four evenings a week for eight months of the year, and although, of course, a corresponding portion of the daytime is allowed, still the evening hours are not those usually considered most conducive to the best work. The routine is rigorous. A teacher may have a couple of hundred students to look after

during the course of the week, students belonging to a dozen different sections and classes; there are laboratory preparations to be seen to, exercises to be marked, and a hundred and one things to be done.

And, speaking generally, the salaries paid are quite incommensurate with the work done and with the previous prolonged and expensive training required; indeed, I might say that, as a whole, technical teaching is badly underpaid. A few—a very few—reach positions of comfort and even of comparative affluence, but for the vast majority there is nothing to look forward to. The reason for this unsatisfactory state of affairs seems to lie in the fact that the supply is greater than the demand—a strange position when looked at in a superficial light. But the truth is that young fellows who have just finished a University course, and who may not have their careers mapped out for them by wise or influential guardians, gravitate into the technical teaching profession as easily as flies into a jar of treacle. The commencing salary appeals to them, for they look upon £120 to £150 per annum as rather princely, after earning nothing at all for years past. And once in, there is little chance of getting out. And so it comes about that the supply is greater than the demand, and that the authorities concerned can advertise for a University degree man to teach engineering for £120 a year.

As a general conclusion, I strongly advise all those who have not a strong and very pronounced bent for this class of work, to leave it severely alone.

ELECTRICITY IN THE PURIFICATION OF COAL GAS.

To the electric lamps which are used to light gas works and the electric motors which are used to supply motive power, there is likely to be added, in many modern installations, electrical apparatus for the separation of tar and other suspended particles from the gas. Successful large scale experiments in this connection have been made by White, Rowley and Wirth, their apparatus and results being described in an address to the Michigan Gas Association. The principles employed are those which have been applied so successfully to the precipitation of smelter and acid fumes. A high-tension continuous current discharge is passed between a "squirrel cage" of fine steel wires and a pipe in which the latter are mounted and through which passes the gas to be purified. Suitable current may be secured by transforming alternating lighting supply up to 20,000 or 40,000 volts and rectifying it mechanically by a synchronously rotating commutator. To eliminate risk of explosion, it is obviously essential that there be no air leakage into the precipitating chamber, and it is found that the liability to disruptive discharge from swaying or eccentric

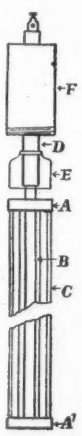


FIG. 1.

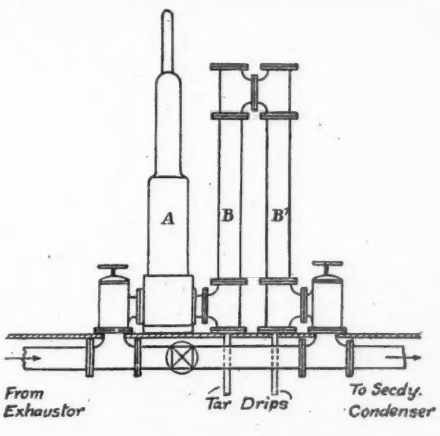


FIG. 2.

electrodes is least if the central wire electrode is made negative. Alternating-current discharge is almost ineffective in causing precipitation.

Fig. 1 shows the form of electrode found best for commercial use. Into the iron pipe F is cemented an insulator D, the lower terminal of which is shrouded by a glass insulating sleeve E. A half-inch gas-pipe B is screwed into a series of cast-iron disks A A', between which run fine steel wires C forming the active electrode. The whole is mounted in suitable nipples within an outer felt-jacketed pipe, forming the earthed electrode. Large scale tests on the electrical purification of 25,000 cb. ft. of gas per hour were made at the Ann Arbor Gas Works by mounting two 5 ft. × 8 in. diameter separating chambers B B', fig. 2, immediately behind a Pelorize and Audouin fractional separator A. The active electrode disks were 4 in. in diameter and strung with 16 No. 27 piano-steel wires. The effective treating distance was 11¼ ft., corresponding to barely 0·4 second's exposure of the gas to electrical discharge. For continuous operation a larger precipitator with longer insulators should be used, but until (after 5 hours' working) tar condensation produced leakage over the short insulators necessarily used in the experimental installation, perfectly satisfactory purification was obtained, and this with an energy input of only 0·2 KW.-hour per 25,000 cb. ft. of gas, using an equipment which cost less than £100, including erection and the necessary alterations in existing pipes. In the Ann Arbor tests, a potential difference of 20,000 volts was maintained between wires and grounded pipe, 2·6 to 3·0 milliamps. then flowing in the high-tension circuit.

By electrical precipitation, coal gas free from tar may be obtained at any desired temperature. If separation be effected before the gas is passed through a condenser, naphthalene and lighter oils are left in the gas. Tar separated at 175° is free from water and resembles the prepared tars used for pavements. Gas thus freed from tar can be cooled in a washer-cooler, any particles of naphthalene then remaining being separated by a second electrical precipitation. Tar cooled in contact with coal gas absorbs some of the illuminants, hence by removing the tar while hot, the illuminating power and calorific value of the gas are improved. By eliminating tarry naphthalene deposits in the scrubbers, cleaner ammonia liquor of uniformly high strength is obtained, and by passing the hot or cold gas up acid towers, ammonium sulphate can be made directly. At present iron oxide purifiers arrest tar fog by mechanical filtration, but at the cost of decreased efficiency in their proper work; with clean gas, oil and tar films are not deposited on the oxide, which therefore works better and longer. In conclusion, it should be noted that the same type of precipitator will purify gas and precipitate smoke, thus preventing the escape of dense smoke during retort filling and producer poking.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Advertising and Character.

In response to your invitation for opinions regarding advertisements, I beg to submit the following remarks.

I may, perhaps, first mention that I have the privilege of supervising and purchasing the plant and stores for several installations, and am directly interested in matters electrically from E.H.T. supply down to electric bells.

I always make a point of going through the advertisement pages of several English and American journals each week, in the hope of picking up something useful, and have to admit that as a rule the English advertisements are not nearly as interesting or as instructive as the majority of the American variety. It is seldom that I see in the home papers anything of sufficient interest to cause me to reflect. Somehow or other the English advertisements do not seem to contain that amount of technical interest or value that many American advertisements possess, and though I am far from saying that all of the American type are interesting—the "Get Acquainted," "Get Together," "Mr. Contractor," and "Mr. Engineer" class are most repellent—I must say that I find myself reading American pages with far more care than I do our own journals.

I think much of this is due to the fact that so many English advertisements contain the sort of bald information that one gets on the card of a manufacturer's representative, *i.e.*, that Messrs. Jones & Co. are manufacturers of every kind of dynamo and motor. As a statement of fact, this may be true, but as an advertisement it is of very little use—lots of people tell the same tale—in addition to which similar information may be found in your classified index.

May I illustrate my meaning from one or two examples in this week's REVIEW (for January 1st)—I take a few at random.

On pages vi, ix, xi and 1 (Supplement), are shown views of various dynamos and motors, but in what way do they vary from thousands of other machines made by different firms? The makers at least do not tell us. It is possible there are a number of points about the turbine illustrated on a later page, which the makers would be glad to place before prospective buyers, but they certainly do not do so in your pages. As it is, the advertisement is a very poor one, and the illustration little better.

On the other hand, the advertisement on page xv is very much better—it contains interesting information, though it happens to deal with an accessory which I suppose is not much in demand just now. The lower advertisement on page 1 (Supplement) is good in its way. It illustrates the article and describes tersely its special features. The advertisement on page 3 (Supplement) is also interesting. I know of several occasions on which a similar page has been cut out for reference purposes—it gives much information in a small space.

Other good advertisements from the reader's point of view are shown on page xx [This is editorial matter.—EDS] (but not on page xix) and page xxx.

A fearful thing is that in the centre of page xxxi, where we are invited to take part in a kind of spelling competition. It may be interesting when you have worried it out, but I doubt it, so I turn the leaf quickly.

One other thought. Some little time ago a friend was criticising the advertisements which appear in the English electrical Press, with those which are published in the leading mechanical journals, to the effect that, as a rule, they were illustrations of comparatively trifling articles. To some extent I felt the criticism was correct. The majority of purely electrical advertisements are for goods which are relatively inexpensive, though numerous, and to secure a good market for accessories and small machinery, it is undoubtedly necessary to advertise largely, and, as already mentioned, in an interesting manner.

Were I a manufacturer, I should occasionally advertise a large plant, or a quite special piece of apparatus, in the endeavour to obtain a reputation for interesting and instructive advertisements. This attained, I should be sure of attention when the every-day manufactures were shown.

W. H. B.

January 4th, 1915.

The correspondence on "Advertising and Character," inaugurated by "Consultant" in your issue of January 1st seems likely to rove over the whole field of advertising generally without any very obvious bearing on the peculiar needs of the electrical and "allied" trades. This doubtless affords not only ample but extremely interesting matter for discussion, but it is necessary to remember that though governed by the same general princip'es as apply to all other successful advertising, technical advertisements have special considerations to face which materially affect the application of these principles. It is on this point that an exchange of views is most needed and would be most helpful.

Some of your correspondents seem to me to take a more pessimistic view of things than is warranted by the facts. It is quite true that any man of experience, glancing through any number of advertisement pages, can make a pretty accurate selection of those advertisements which have been prepared with some knowledge of advertising requirements, not necessarily complete or extensive. It is also true that these are but a small proportion of the whole. Still it is an increasing proportion, and those who remember what advertising was only 20 years ago, and remember, too, how slowly this old world moves, have no reason to be disheartened at the present rate of progress.

Reverting to the main subject, we are all, I take it, agreed that the first essential of a good advertisement is to attract attention. But what sort of attention? I have seen advertisements which certainly attracted attention, but which were calculated to kill any buying disposition on my part as effectively as a crack on the head from a policeman's baton kills sensation. Obviously, therefore, the principle of attention needs to be applied in its proper relationship with another principle stated by Mr. Hill, as "to give a bias in favour of the advertised article."

If it were not invidious to mention names, I would pillory a recent advertisement of (excision by Censor) which has for some time been occupying a full page in (excision by Censor). The advertisement in question is a big splodge of black, through which emerge five or six lines of curiously shaped letters, the whole forming a puzzle in black and white of most surpassing hideousness. It attracted by its very ugliness sufficient of my attention to induce me to work the puzzle out, but never have I seen energy, and, apparently, enthusiasm, so perversely directed to the production of such an appalling monstrosity. It exemplified exactly the type of advertisement to which you refer in your editorial as "striking the eye but having, in the long run, an unfavourable effect," in this case on the artistic sensibilities.

There is another type of advertisement which seems to me to "border on the offensive," viz., that which tells a man what a wasteful fool he is for not buying such and such an article. In this connection the principles of true salesmanship have considerable bearing. I well remember a gentleman calling on me to try and sell space in his publication. After the usual stereotyped recital of its advantages, I explained that present conditions did not warrant my firm in undertaking any extension. He immediately began with, "That is a very foolish policy," and continued in that strain until I had great difficulty in dissembling my love after the classic manner. When I finally succeeded in conveying to him that the proposition was definitely and unequivocally declined, he left me, but with a feeling that, had his journal been the only one available for our purpose, and the success of my firm depended upon using it, I was to rather commit commercial suicide than consent to pass him an order.

On the question of British and American advertisements, a difference of treatment is rendered necessary by a difference of temperament. Personally, I prefer the British brand, just as for ordinary social intercourse I prefer a gentleman to a costermonger, however entertaining. If the use of slang phrases and "smart" slogans is desired, they are much better placed among their natural affinities than in the columns of the ELECTRICAL REVIEW.

I entirely agree with your strictures on flippant advertisements so far as technical advertising is concerned. A steam turbine needs to be announced with something of its own dignity and importance. It cannot or ought not to be treated as if it were a case of Sapolio. One does occasionally encounter a good joke in connection with electrical or "allied" apparatus, but it is doubtful if the *selling* effect of a good joke is any greater than that of a bad one.

While, therefore, agreeing with Mr. Hill's few functions of any advertising announcement, especial care is needed in the case of appeals to cultured, specialised and technically trained men to see that they are carried out with a common-sense degree of dignity, the temperate use of language, and perfect truthfulness.

We need not despair because sometimes we fall short of our ideals. It is difficult to maintain heights which, in its best moments, "the soul is competent to gain," but we can still keep our ideal in front of us, and (as you yourselves so recently did) vigorously resent the intrusion of vulgarity, of bad taste, of meretricious smartness and statements not in accordance with plain truth.

E. J. Reed.

London, S.W., *January 11th*, 1915.

Salaries of Junior Engineers.

The A.E.S.E. having agreed during last summer to curtail its activities so that electricity supply authorities and owners of private generating plants should not be in the slightest degree embarrassed during the present critical period, the following, forwarded by the Bradford Branch of the A.E.S.E., should be of general interest:—

1. According to the *Times* of January 7th, the price of bread has risen 27 per cent. since July 31st, 1914.

2. According to our own experience, everything that is necessary is dearer than it was before the war.

3. According to the technical Press, the President of the I.E.E. admitted that junior engineers were underpaid, and said he hoped better salaries would be paid in future, and that our engineer managers should try to remember their own early struggles when living was much cheaper than it is now.

4. According to the advertisement pages of the ELECTRICAL REVIEW of January 8th, there are no less than eighteen (18) advertisements for switchboard attendants and shift engineers at starvation salaries of 20s. to 30s. per week, one or two of which had the magnificent prospects of increasing eventually to the abnormal remuneration or £90 to £92 per annum.

There are also one or two advertisers who dare not state the miserable pittance they are prepared to pay.

5. There is a shortage of skilled labour for central station work due to so many having enlisted to serve their country during the war, and, in consequence, many men are doing extra work or otherwise helping to keep things going on as usual, in many cases at considerable inconvenience and self-sacrifice.

What are we to understand from reviewing the facts as stated?

One thing, and one thing only, and that is that our engineer managers have come to the almost unanimous conclusion that the junior engineers are not worthy of the wage of a casual labourer (who gets 7½d. an hour), and that now is an opportunity of bringing a crowd of unskilled labour into the central stations and substations all over the country, and of getting these men or boys taught how to go on when things are "O.K." in a mechanical sort of way, and trusting to luck, when things go wrong, to muddle through somehow.

They, the station engineers, are at their old practice again, a practice condemned by all other business men, of cutting down the wages to cut down the expenses, forgetting that the lower they cut the wage the higher their maintenance and repair bill will go, and the final result is just the reverse of what they want.

The more that Presidents of the I.E.E. and other "men who know," ask that the junior branches be better remunerated, the worse it seems to be for them in the end. Is it spite or ignorance?

W. J. Ebben,

Hon. Gen. Secretary A.E.S.E.

London, N.F., *January 11th*, 1915.

Wonderful Accumulator Cells.

If you will allow me to reply to "A. W. B.'s" satirical criticism of my test cell, I should like to ask the following questions:—

Why does "A. W. B." not state the colour of the positive plate?

Why no mention of the condition of the most important part of any storage battery, viz, the negative plates?

Why no mention of the fact that there is no visible white sulphate on any of the plates?

Had "A. W. B." mentioned these points his letter would have only been a good criticism of his own lack of technical knowledge in regard to small storage batteries which are made up in celluloid cases.

For the benefit of your readers who have not seen this cell, I may state that the positive plate is light brown, which is the usual colour of a discharged positive plate. The negative plates are dark slate colour and quite clean. I cannot follow the inference suggested by the statement: "The positive plate is now of normal size"; perhaps "A. W. B." will oblige. Should he care to have a 4-volt cell with the ordinary celluloid separators in one side and the type used in the "Wonderful, &c.," in the other, he can test it in any way he likes; very soon he will find the peculiar affinity that lead sulphate has for celluloid separators. Sulphate of lead visible as an insoluble white salt is quite a different thing to get rid of to the invisible sulphate, which no lead type of cell can work without.

The "Motorman again" remark I consider is in very poor taste; they are not all lacking in scientific training. It is naturally an advantage to users of storage batteries for inspection lamps, &c., that if they have been forgotten (one case I know of for two years), they are in a condition which enables them to be charged up and used within a reasonable time, without the usual cleaning and repairs.

A. Faraday Hawdon.

Newcastle-on-Tyne, *January 9th*, 1915.

Garage Heating.

The problem suggested by "Interested Inquirer" in your "Correspondence" column of January 8th is complicated, because of the great variety of motor-car habitations known collectively as garages. A garage may be anything, from an open shed to a well-built brick house with a very wide intermediate range, so that the heating of each must be treated on its merits, it being quite impossible to propose any general form of electrical heating that would meet the economical necessities of most motor users. To prevent the radiator freezing I, myself, use a 60-watt carbon lamp, which, for this purpose, I connect to the heating circuit at the 1d. rate; it is put under the bonnet and the whole covered over with a piece a felt, the result is entirely satisfactory; usually the lamp is on during frosty weather from 8 p.m. to 8 a.m., costing about two-thirds of a penny, if severe frost continued for a whole week, an unusual event, with 24 hours' running per day my liability would be about 10d., not a very serious one. This experience relates to a well-built brick single garage with substantial wooden doors and the motor run in bonnet first. If I wished to heat the whole garage electrically, I should first give very careful attention to stopping up every inlet for cold air, protecting the wooden door by a liner of felt or canvas.

P. 6,817.

Contracts with Alien Enemies.

A short time ago you were good enough to publish a letter of mine in regard to the desirability of commercial men urging the introduction of a Bill, in the coming session, covering the determination of contracts with the enemy.

I pointed out that at the end of last session, the Attorney-General promised to go closely into the matter and possibly introduce a Bill, it only remaining with the commercial world to convince him that there was unanimity as to what was really wanted, and that practical clauses would be formulated.

In connection with this matter it is interesting to note a book, which has just been published by Prof. Finlayson Trotter, on "The Law of Contract during War." The book, of course, covers the whole field of contracts, but it is markedly noticeable in the particular case of continuing contracts (or executory contracts, as they are called in this book), that there is an entire absence of any legislation dealing specifically with the subject, and, in fact, no judgments can be cited which give any guidance by way of precedent.

May I quote a couple of sentences which give full evidence in this respect:—

"An executory contract is a contract which is either wholly unperformed, or in which there remains something to be done on both sides. There is little or no authority in English law as to the effect of war on such contracts concluded with alien enemies before the commencement of hostilities."

The whole state of the intimate commercial inter-relations between ourselves and Germany at the beginning of the war was quite unique. Trading between the two countries had developed to a degree altogether unprecedented. In no case in history has a war taken place with such collateral conditions. We cannot expect, therefore, that legislation should have anticipated all the difficulties which have arisen. Now, however, occasion demands adequate Parliamentary measures—and the electrical industry have considerable interests involved. The only thing likely to endanger any measures going successfully forward is for the commercial world to disagree among themselves and bring forward demands mutually irreconcilable.

T. W. Cole.

Wandsworth, S.W., *January 9th*, 1915.

Cab-Signalling Systems.

Four fallacies were conspicuous in the cab-signal discussion at the recent meeting of the Institution of Mechanical Engineers. These errors are:—

1. Cab signals should be audible only.
2. Cab signals at present employed in England are satisfactory.
3. Railway electrification presents difficulties to ramp systems.
4. Wireless systems possess practical value.

Of these four mistakes, the first is the only one for which there ever was any excuse; but that excuse has been destroyed by repeated publication of proof of the fact that a cab signal ought to be both visual and audible. It has, for instance, frequently been shown that a driver can watch the track more constantly and more vigilantly with a cab signal that is both visual and audible than he can with fixed signals alone.

Cab-signals of the kind at present employed in England have produced dangerous errors. It is well known that such cab signals fail to fulfil an exceedingly important requirement, viz, that any one or more earths, and for open circuits, must not produce a dangerous error. Two cab systems that fulfil this specification have been proposed in England, but, strange to say, preference has been given to cab signals that are admittedly inferior to them.

The third fallacy is quite novel—and equally surprising, in view of the fact that experience has conclusively proved its utter baselessness. The London underground railways present the maximum difficulty (?) that could arise—two-power rails, in addition to the two track rails. There would be, if anything, even less trouble to find room for cab-signal ramps than there has been in finding room for the stop-arm cylinders, &c.

Wireless cab systems, whether Hertzian or Faradic, are worthless. None have yet appeared that could stand a proper test. In those that have been publicly tested (?), two earths will suffice to wreck a train. If such cab systems could be used at all, tuning on the locomotive would have to be resorted to; and such tuning is as impossible signally as it is possible electrically. No Hertzian nor Faradic system has as yet appeared which gives three distinctive indications—one for "clear," a second for "run slow," and a third (plainly different from both of the others) denoting "stop." The writer has tested full size, in England, ramp cab signals that fulfil this important stipulation, by which all wireless cab systems have thus far failed.

It has been said that at recent wrecks at Rugby and London Bridge, the driver knew the distant signal was against him, and that "a cab signal could not tell him more." *Per contra*, I have tested cab signals that not only could tell but have told the driver more. A proper cab signal would have prevented both of these wrecks, for such a signal would have given both distant and home information.

Detonator-placing machines are not nearly so safe nor reliable as cab signals. None of the train crew can hear the momentary report of a detonator any more clearly than they can the continued blowing of the audible cab signals. In the best detonator systems an exhausted magazine or a broken or dirt-clogged detonator-arm means an imperilled train; but an exhausted battery or the presence of dirt or frost could not produce any errors but safe ones in the best ramp-type cab signals.

Wm. H. Dammond.

Nottingham, *December 29th*, 1914.

London County Council's Electricity Bill.

Now that the time of petitioning against the London County Council's Bill (viz., February 12th) is drawing near, it is gradually becoming clear that the Bill has very little chance of success. The opposition appears to be getting so pronounced that it seems really questionable whether the London County Council itself will proceed with it even as far as Parliament.

There is still one more occasion on which the Council has to give its consent before the Bill can finally proceed, and even the supporters of the Bill seem to be getting somewhat lukewarm, if one may judge from the debate which took place when the Bill was last before the Council.

The root of the trouble appears to be that the scheme is unnecessarily ambitious, and that practical thoroughness has been sacrificed for theoretical completeness. For instance, a great part of that huge weight of the opposition from the Councils in outer London could easily have been dispensed with without touching the scheme vitally. There seems to be no point in including a very large portion of this outer London, since the inclusion does not benefit the scheme (except in this purely theoretical idea of completeness), while it naturally raises strenuous opposition, since it means possibly commandeering from the rates of those districts.

Then as to the existing municipal undertakings in London itself, the proposal that they must in future carry on their business of electricity supply subservient to the new electricity authority, naturally makes these also into enemies even outside other points.

Farther, the Councils who own no electricity undertaking, and who have always resisted municipal trading, naturally are violently opposed to this thinly disguised scheme of municipal trading, which has all the disadvantages but none of the advantages, namely, that its losses must be paid out of the rates without any of the benefits of exclusive ownership and exclusive profits.

Then as to the companies. It is only natural that these should strenuously oppose. They have expended so many millions of capital on the strength of the existing Acts and Provisional Orders. The London County Council now proposes either to take these over under entirely unsatisfactory conditions, or else to domineer their working and possibly authorise competition.

Then as to the ratepayer and public generally. The proposal to embark on a scheme ultimately involving, say, 40 to 50 millions in which the security of the rates plays a great part, naturally, at this time of national stress, they view as an entirely unwarranted risk.

It would indeed be interesting to know what individuals are really in favour of the scheme, except the engineers who have prepared it and a small proportion of the Electricity Committee itself, and possibly a very meagre sprinkling of London County Council members.

Balancing up all the foregoing facts, it certainly seems very unlikely that the Council will proceed. They would have to say to Parliament that nobody wanted the Bill, that it was supported very lukewarmly in their own Council, and that there was no immediate necessity at the present moment for floating such a colossal financial scheme, and that the only good they could promise for a large number of years is the possible small reduction in the cost of electricity, and this is only in certain districts and to certain people.

It certainly seems unfortunate that the early good promise which was given when the London County Council first undertook to formulate a scheme has reached this stage of fiasco. One factor in it certainly is that the London County Council Electricity Committee proceeded somewhat too independently and rode roughshod without practical consultation over the interests of existing undertakings. This certainly was most markedly so in the case of municipal undertakings, and these from the very first have protested against the way in which the Council ignored them when formulating the scheme. Probably the same line of procedure elsewhere has resulted in this wholesale opposition.

Londoner.

D

Over-Pressure Protective Gear.

In some articles of mine on "Over-Pressure Protective Gear for High-Tension Circuits," which you recently published, I drew attention to the oft-repeated fallacy that the horn gap discharger tended to produce over-pressures on breaking the circuit. I pointed out that not only was this not the case, but that, on the contrary, nearly all other forms of gap, such as the electrolytic and the Giles valve, were much more likely to cause pressure rises, although generally credited with opening the circuit at zero current, in the same way as an oil switch.

Some tests have recently been published by Dr. Linke (*E.T.Z.*, 1914, Part 27), which I had not seen when writing, and these so fully confirm my conclusions that I think it may be of interest to allude to them. Oscillographic and other methods were employed for measuring the rises of pressure which occur on closing as well as on opening a circuit. Both a horn break and an oil break were tested in this way.

One typical experiment may be cited. In this case a low-tension inductive circuit carrying 1,000 amperes was opened by the blowing of a fuse across the gap. In the case of the horn break, the pressure rose to twice the normal, whereas with the oil break the rise was to no less than 50 times the normal.

The author points out that a pressure rise depends, more than anything else, upon the rapidity with which the current is broken and that, consequently, it is far safer to break the circuit at a horn gap, with its gradually lengthening arc, than by means of any form of quenching gap.

I would add that, even if it could be conceded that a particular form of gap did actually open the circuit at the instant of zero current, it does not by any means follow that the stored energy (*i.e.*, magnetic) is also zero at that instant, and unless this is the case a sudden break will cause a serious rise of pressure.

In a further series of experiments, a 10,000-KW. high-tension generator was short-circuited at a horn gap. An oscillogram shows that the pressure across the gap falls to zero, and then gradually increases to the normal as the arc lengthens and breaks. The entire process occupies only a few cycles, and the smoothness of the voltage curve is remarkable. On repeating the experiment with an oil break switch, the current was found to fall suddenly to zero, with the result that severe over-pressures were set up, and the arc was re-started across the gap a few cycles later.

The above experiments seem entirely to confirm the conclusions given in the articles in question, viz., that the horn gap breaks the arc so gradually that no over-pressures are produced, whereas with those forms of gap which break the circuit rapidly the reverse is found.

I may add that since writing these articles, I have received some instructive statistics from one of the largest supply companies, having a very extensive E.H.T. underground system (the name of which, I am, unfortunately, not at liberty to mention) and which is equipped with a number of Brazil resistances and horn gap dischargers. Up to the end of 1913, these gaps were set to spark across at 50 per cent. above normal pressure to earth. In January, 1914, the settings were reduced to 30 per cent. above normal, with the interesting results given in the following table which shows the number of discharges recorded, as well as the number of breakdowns which occurred to the end turns of the motor-generator sets.

Year.	*No. of breakdowns.*	*Discharges recorded.*
1911	5	6
1912	6	14
1913	11	10
1914 to October 1st	1	70

It will be seen that the breakdowns, which in 1913 with the 50 per cent. settings amounted to 11, were reduced to 1 for the first nine months of 1914, a reduction to practically one-tenth of the former number. At the same time the discharges recorded increased from 10 to 70, showing conclusively, I think, that the reduced number of breakdowns was entirely due to the arresters.

Kenelm Edgcumbe.

January 11th, 1915.

Individual Driving of Looms.

In the "conclusion" of the abstract of Mr. Crowley's lecture before the Halifax Textile Society given in your issue of the 1st inst., it is stated:—"It is exactly four years since experiments were carried out which led to the putting down of the first large individual driving installation in this country—that of 800 motors in the shed of Messrs. Frears, Lord & Brother, Bradley Fold. When the order for this pioneer plant was placed, only one British firm could manufacture loom motors, and that firm got the order." A similar misstatement to that at the beginning of the above quotation appeared in the *Manchester Guardian* some two or three years ago, and the Westinghouse Co. then correctly pointed out that prior to the Frears, Lord installation they had completely equipped and put to work an individually driven shed for Messrs. Edward Hibbert & Co., of Hyde, all the apparatus having been manufactured in Lancashire. Mr. R. Blackmore, of Stalybridge, was, I believe, the consulting engineer. This being so, Mr. Crowley's second statement is obviously incorrect, since the Westinghouse Co. were not responsible for the Frears, Lord equipment.

Weaver.

The City Guilds' Electrical Examinations.

The examinations conducted by the City and Guilds of London Institute in all branches of electrical engineering work constitute an annual event of some importance in the electrical world; the more so as considerable developments take place in nearly every branch year after year.

This being so, it is surprising to find that most of the electrical journals entirely ignore these examinations; and in so doing we venture to suggest that they miss "matter" that would be of great interest to various sections of their readers.

Surely more than half the readers of a journal would be interested to know the nature and scope of the year's questions appertaining to their particular branch of work; and the publicity would certainly help to increase the number of candidates year by year. There is need, we believe, of encouragement in this direction.

The perusal of carefully-set examination questions will often convey valuable points to the reader; and perhaps a little tempered editorial criticism of certain of the questions would not be amiss when the opportunity arose.

The examiners' reports on the results of their respective examinations are quite interesting matter; and the successful efforts of those examinees who have distinguished themselves by gaining medals and prizes should be noted as a matter of course.

In brief, we would submit that we do not make enough fuss of our technological examinations.

A. P. Lundberg & Sons.

London, N., *January 11th*, 1915.

A.C. v. D.C. for Lighting.

I note in the "Correspondence" columns of your issue of January 8th, under the heading of "A.C. *v.* D.C. for Lighting," a letter from "Ex-Gas." I would refer him to an article which was published in your paper describing a similar lighting scheme at Messrs. Elliot Bros.' works at Lewisham, which is, in my opinion, one of the most successful examples of works lighting that has ever been carried out. Though I advised on the general lay-out of the scheme, I am certain that my judgment in this matter is not in any way prejudiced, as I have had every opportunity of examining similar schemes which have been carried out on the direct-current system, and have not been so effective owing to the high candle-power and fragility of the lamps necessitated by the higher voltage.

Haydn Harrison.

[The article appeared in our issue of July 24th, 1914, p. 141.—Eds. Elec. Rev.]

OUR LEGAL QUERY COLUMN.

"O. H." writes: "I have a recollection of having read a report of a case in your paper connected with a supply of electricity being given outside the area of supply covered by a 'Provisional Order,' or rather the supply was given at some point within the area, but the electricity was actually used outside. The decision, as I recollect it, was that the supply was being given outside the area of supply and was illegal."

*** There is no case in which it has been decided that the use of electricity supplied within, but consumed outside, an area is illegal. It has, however, been held that gas cannot be so used. By the Metropolis Gas Act, 1860, Sec. 6, the limits of each of the gas companies then supplying the metropolis were defined, and in the result, each company enjoyed a practical monopoly in its own district. One of these companies, at the request of a railway company, placed a meter on a part of a railway station lying within the gas company's limits, and through it supplied gas to other parts of the premises situated outside the company's limits, and within the limits of another gas company. The Court of Appeal held this to be lawful on the ground that the sale and delivery of the gas took place at the meter; but the House of Lords reversed this decision, holding that the gas was supplied where it was consumed, and therefore that the company were transgressing their authorised limits (Gas Light and Coke Co. *v.* South Metropolitan Gas Co. (1889) 62 L. T. 126). This decision was followed in the case of a water company, and it is conceived that it would also be followed in the case of electricity. It is important to note, however, that by Sec. 6 (1) of the Electric Lighting Act, 1909, a supply may now, by leave of the Board of Trade, be authorised outside the area of supply.

Rail Manufacture in Australia.—A Reuter dispatch from Adelaide, dated January 9th, states that the first shipload, comprising 2,800 tons, of iron-stone from the huge deposits of Iron Knob has left Port Pirie for the Broken Hill Proprietary Co.'s iron and steel works at Newcastle (N.S.W.). It is expected that the works will be open in March and that rails will be manufactured by May.

EXPENDITURE UNDER ELECTRICAL PRIVATE BILLS.

The following information is contained in the deposited estimates in connection with the Private Bills for the coming session or in the Bills themselves so far as they concern electrical undertakings:—

	£
Dewsbury Corporation (Mr. H. Dearden, borough engineer).—Purchase of land, £400; building tramways and omnibuses depôt, £7,135; construction of tramways, £8,390	15,925
London County Council Tramways and Improvements (Mr. G. W. Humphreys, engineer).—Tramways, £96,700; reconstruction of Whitechapel High Street terminus, £2,500; reconstruction of Tower Bridge Road to Lower Road line, £68,000; street widenings and improvements, £73,500	240,700
Aberdare Urban District Council (Mr. S. Sellon, engineer).—Construction and equipment of tramways and tramroad, £43,752; installation of railless traction and reversing apparatus and plant, £5,906; provision and equipment of motor omnibuses, £8,500; street works, £3,600; lay-out of recreation ground, £2,600; land and buildings, £1,502	65,860
Metropolitan District Railway (Mr. A. R. Cooper, engineer).—Construction of 1 furlong 3.35 chains of single line (including £47,740 for land, buildings and easements)	73,429
Dunfermline and District Tramways Extensions (Mr. C. Don, engineer).—Construction of eight sections of tramway, of which the longest is 1 mile, 2 furlongs, 3.61 chains, double throughout	48,898
Edinburgh Corporation (Mr. A. H. Campbell, borough engineer).—Construction of 4 miles, 6 furlongs, 7.10 chains of tramway, £89,069; erection of tramway shedding and depôt and tramway leads into same, £7,500; street widenings and other works, £20,154; land and street widenings, £45,406	162,129
Sheffield Corporation (Mr. C. F. Wike, engineer, Mr. A. R. Fearnley, manager of tramways).—Construction of 4 miles 4.9 chains of tramway, £10,366; construction of 1.3 chain tramway, £1,165	11,531
Rhondda Urban District Council (Mr. E. Hazeldine Barber, engineer).—Construction of 2 miles 5 furlongs odd of tramway	25,568
Rotherham Corporation (Mr. E. B. Martin, borough engineer).—Streets, £4,311; tramway No. 1, £4,311; tramway 1A, £509; tramway No. 2, 5 miles, 2 furlongs, 6.92 chains, mostly single line, £49,537; alterations of levels of roads, £341	60,099
South Shields Corporation (Mr. L. Roseneare, borough engineer, Mr. W. Tuke Robson, tramways manager).—Tramways	16,711
Halifax Corporation (Mr. J. Lord, borough engineer).—Permanent way for tramways, £109,909; tramway rolling stock, £14,000; electrical equipment of tramways, £11,174; electrical feeders, £8,673; electrical equipment of trolley vehicles, £5,255; electrical feeders, £1,182; trolley vehicles, £5,100; extension of tramshed depôt, £6,000; motor omnibuses, £3,600	164,893
Sunderland Corporation.—Tramway over reconstructed Wearmouth Bridge	712
Stalybridge, Hyde, Mossley & Dukinfield Tramways and Electricity Board (Mr. R. Blackmore, engineer).—Tramway No. 1, 1 mile, 1 furlong, 6.70 chains, £11,625; No. 2, 1 mile, 7 furlongs, 9.60 chains, £17,860; No. 3, 1.20 chains £166; No. 4, 1 mile, 3 furlongs, 6.50 chains, £12,376; No. 5, 1.40 chains, £183; No. 6, 1 mile, 5 furlongs, 0.60 chains, £15,069	57,270
London and District Electricity Supply (Mr. G. W. Humphreys, engineer, L.C.C., Messrs. Merz & McLellan, consulting engineers).—Railway siding (Work 6), £2,944; railway siding (Work 7), £2,464; works other than railway sidings, £270,100	275,600
Lincoln Corporation.—Provision of trolley vehicles, £10,200; electrical equipment of trolley vehicles, £5,500; omnibuses, £10,800; construction of tramway shelter, £2,300; construction of buildings, and purchase of plant and machinery in connection with extension of electrical generating station, £43,000	71,800

WAR ITEMS.

Telegraphs at the Front.—The *Times* recently published a letter from an officer regarding the Field Telegraphs, or Signal Service, as it is now known, from which we quote the following:—

"Most of the important towns in the North of France, and also London and Paris, are in direct touch with General Headquarters. These are called the main lines of communication, and over their wires day and night passes a continuous flood of traffic for the hospital bases, ordnance, remount and store depôts. From General Headquarters radiate wires to the various army corps headquarters, and again, each army has its communications to the divisions, which, further, have wires right up to the brigades. It will thus be seen that in the space of a few minutes the War Office is fully and clearly informed of what is going on in the firing line. In fact, were the lines joined straight through it would be possible to hear the roar of artillery and the bursting of shrapnel in St. Martin's-le-Grand.

"As the tide of battle turns this way and the other, and headquarters are constantly moving, some means have to be provided to keep in constant touch with General Headquarters during the movement. This emergency is met by cable detachments. Each detachment consists of two cable wagons, which usually work in conjunction with one another, one section laying the line whilst the other remains behind to reel up when the line is finished with. A division is ordered to move quickly to a more tactical position. The end of the cable is connected with the permanent line, which communicates to Army Headquarters, and the cable detachment moves off at the trot; across country, along roads, through villages, and past columns of troops, the white and blue badge of the Signal Service clears the way. Behind the wagon rides a horseman, who deftly lays the cable in the ditches and hedges out of danger from heavy transport and the feet of tramping infantry, with the aid of a crookstick. Other horsemen are in the rear tying back and making the line safe. On the box of the wagon sits a telegraphist who is constantly in touch with headquarters as the cable runs swiftly out. An orderly dashes up with an important message: the wagon is stopped, the message dispatched and on they go again.

"At Le Cateau the situation was so desperate that signal companies were sent to the trenches to assist the infantry in repelling a heavy attack. For this piece of work we were highly complimented by General Smith-Dorrien, who, at the same time, expressed his great satisfaction at the way in which his communications had been established throughout the campaign.

"Telegraphists are often left on duty in the trenches and lonely farmhouses, chateaux, &c., close to the firing line, and I leave it to your imagination to picture how difficult it is to concentrate one's mind on the signalling and reception of important messages while the air is filled with the deafening roar of artillery and the screaming and bursting of shells. . . . . Wireless telegraphy, of course, plays an important part in this war, most of the larger aeroplanes being equipped with apparatus, by which means they swiftly communicate important observations to headquarters. The Germans also make elaborate use of this system."

Board of Trade Electrical Exchange Meeting.—We have referred on previous occasions to the "Exchange Meetings" organised by the Commercial Intelligence Branch of the Board of Trade for the purpose of bringing before manufacturers samples of goods manufactured in Germany, and placing them in touch with purchasers of such products. The object of these meetings is, of course, to assist British manufacturers to capture trade that has hitherto been in German and Austrian hands, and last week the meeting was devoted to the electrical accessories trade. A collection of samples had been got together, not, perhaps, imposing in magnitude, but representing a great variety of articles, and in the aggregate a still greater volume of trade—for a single small sample may stand for an import value of thousands of pounds per annum. The samples were all labelled for reference, and many of them bore prices, which seemed in many cases absurdly low. It would be exceedingly interesting to set alongside this collection a similar display of British-made articles with prices attached; this, however, though enlightening to the inexpert, would be superfluous to the specialists in particular branches, who have the British prices at their fingers' ends, and are able to effect comparisons without such aid. While many of the items exhibited were of the character commonly understood to be implied by the phrase "made in Germany," it cannot be denied that others were of high-class manufacture, and in some branches, such as medical apparatus, glassware, enamelled iron shades, &c., the Germans have hitherto had it all their own way.

There was a great variety of porcelain parts, fuse-blocks, ceiling roses, insulators and similar accessories, which appeared to be of good quality and finish. Many lampholders and other brass goods were shown, which did not impress us favourably. The samples of insulated wires and cables were in no way representative of the large imports under this head. Large globes, well glasses, ornamental glass shades, and opal or opalescent glassware made a much better impression, and there was a small exhibit of arc lamp carbons which stood for a very big trade. Specimens of wood pateras, base-boards, &c., also probably signified a great deal more than might appear, as large quantities of woodwork have been imported from the Continent in the past.

Bell pushes and pressels and small bell switches were shown in a variety of patterns; many of these were of poor quality, but some had handsome cast brass covers. A few electricity meters and small volt and amperemeters, small motors, magnetos and fans reminded us of the very large import trade in these items; near them was a collection of electric toys, more or less rubbishy.

A time switch made by ingeniously modifying a common alarm clock was noticed, amongst samples of air blowers for hair drying, electric irons and kettles, motor-car lamps and ignition plugs, and one neat little iron in a leather case which would make a "useful present" to a lady. Many patterns of cheap electric bells and indicators, a few telephones and parts, pocket lamps and portable bull's-eye lamps, conclude the list—though perhaps by no means least in importance as representing a considerable annual value. It will be noticed that in many instances similar articles have long been manufactured in this country, and the only question in such cases is how to get down to the German prices without sacrificing quality; in other instances, pocket lamps and glassware, for example, the trade has been almost entirely foreign, and strenuous efforts are being made by British firms to fill the gaps.

We hope that the result of the efforts of the Board of Trade will be the development of new manufactures in this country and the extension of existing businesses; manufacturers and representatives of wholesale houses who were not able to be present need only communicate with the Commercial Intelligence Branch of the Board in order to obtain the fullest possible assistance within its power, as the Board is anxious to leave no stone unturned to promote the national interests.

We extend a cordial invitation to manufacturers and their representatives to send us any observations that they may feel able to make as a result of their inspection of the exhibits. The publication of the views of experienced minds regarding these articles would, we feel, be most valuable to the British electrical industry at the present important juncture in its history.

An Urgent Appeal for Assistance.—We wish to appeal to our charitably disposed readers on behalf of a very deserving couple who are in sore straits. For some time past they have been enabled to keep a roof over their heads through the generosity of one of the electrical benevolent funds, but circumstances have now arisen which make assistance of other kinds necessary. The man, who was formerly a telegraph instrument inspector, lost his eyesight some years ago, and all he can do is to earn a trifle by typewriting or knitting. His wife is a Swiss, who speaks French and English well, and is a hard-working woman prepared to take in lodgers, and so keep a home together. Belgian refugees who were with them have returned to Belgium, and they have no means of meeting rent charges. It occurs to us that there may be some of our readers who could recommend them lodgers (the house is described as a pleasant one and is situated in Stockwell), or who would be prepared to place with them, and pay the charges for, some respectable Belgian refugees. We believe the latter course will commend itself as an excellent way of "killing two birds with one stone," as the doctor said when he visited two patients in a remote neighbourhood. We shall be pleased to put any reader in touch with the parties referred to, or communications may be addressed to Mr. F. B. O. Hawes, of the Electrical Trades Benevolent Institution (Phone No.: Brixton 1833).

Trade Follows Travel.—It is stated that the ss. *Finland* has been chartered by the Fidelity Trust Co., of Baltimore, and will sail on January 27th for a cruise completely encircling South America, with the object of establishing better trade relations between U.S.A. and South America. The *Financial Times* in discussing the movement, quotes the president of the New York Central Line, to the effect that "trade undoubtedly follows travel." He speaks, of course, as a railway authority, but he merely says what we have urged upon the notice of British manufacturers scores of times, and many of them have testified to its absolute accuracy in recent years, as they have experienced better business as the result of their efforts. There will undoubtedly have to be much more of the most capable British travelling to all quarters of the globe in the interests of our industries directly. We hope that those destined to fill such engagements will not overlook the necessity for being prepared with linguistic and other qualifications in good time. We, of course, do not suggest that "travel" is the only matter of importance—there are many others, but this is one of the things that will be needed, whatever developments take place in general trade policy.

An Appeal.—The Belgian Chamber of Commerce in London (Incorporated), 24, St. Dunstan's Buildings, St. Dunstan's Hill, E.C., appeals to British manufacturers and merchants for support. Since the beginning of the war its task has naturally become much more arduous than in previous years. After the cessation of hostilities the Chamber will have very important duties to perform in helping the commerce of the two countries by bringing together manufacturers and buyers of goods and in many other ways. But we are informed that the Chamber finds great difficulties in carrying out its duties through lack of funds, as the demand has been greater than ever before and Belgian supporters are unable now to send their usual remittances. Applications for membership and contributions may be sent to the general secretary, Mr. P. Dorchy, at the above address.

German Tires.—At a recent meeting of the Halifax Tramways and Electricity Committee of the Halifax Corporation, Alderman Whitley Thompson directed attention to a charge made by Liga Tires, Ltd., of £56 for tires. He understood that this was a German firm, and, therefore, he supposed that cheques would not be issued to the concern until after the conclusion of the war. Ald. Spencer explained that Liga Tires, Ltd., was a London firm which existed for the circulation of German tires. He believed the company was now in liquidation, and, as the Committee had a large claim against the firm, the cheques would not be handed over to the liquidator until that liability had been met.

Belfast Electricians and National Relief.—The electrical department of Messrs. Harland & Wolff, shipbuilders, Belfast, is well represented in the list of contributors from the various departments to the National Relief Fund.

Old Briars Wanted.—We read in a Scottish newspaper that the Glasgow tramways Department are collecting pipes for the soldiers at the front and in the hospitals abroad, and also for the men of the Navy. "Up to date 31,409 pipes have been received, most of these being old briars. This number is very small compared with the number required, as, in many instances, one pipe has to satisfy many smokers. The tramways staff are still prepared to receive at 46, Bath Street, Glasgow, any pipes, and have them thoroughly cleaned and dispatched to the front."

Oldham Tramway Contracts.—The Town Clerk of Oldham has informed the Tramways Committee that the High Court, on the hearing of a test case for the recovery of the price of goods sold and delivered, has held that the plaintiff company incorporated in England was entitled to recover payment, although the shares were mainly held by alien enemies. He added that he had settled the action of the Polack Tyre Co. by payment of the debt without costs. The Tramways Committee has approved this action, and has instructed the borough treasurer to pay the accounts due to the Tudor Accumulator Co., Ltd., Dukinfield, which had been held over.

Relief Allowances to Municipal Employés.—The Rochdale Tramways Committee has been considering the case of a man who in June last was allowed to go on the tramcars to learn the duties of a conductor; he was not actually employed and receiving wages when the war broke out, nor for some time after. Now he has joined the Colours, and the question the Committee has had to decide is as to whether he is entitled to the half-pay granted to men enlisting who were on the staff when war broke out. By a majority of one, it has been held that he is entitled to the half-pay.

Cable Manufacturing at Perivale.—At the meeting of the Greenford District Council last week, Mr. L. Roberts wanted to know whether the firm of Messrs. Geipel & Co., whose plans for the erection of works at Perivale had been recently passed by the Council, was a German one. He understood that before the war the firm got its cables from Germany, but the intention now was to manufacture them at Perivale. The surveyor replied that the head of the original firm was naturalised in 1848. That gentleman was now dead, but he (the speaker) had made inquiries and was of opinion that the firm was "all right." Ultimately it was agreed to enter a minute to the effect that Mr. Roberts had raised a question on Messrs. Geipel's plans, and that the chairman had ruled the matter out of order.

Trade with Australia.—The Agent-General for New South Wales (123-5, Cannon Street, E.C.) published the following advertisement in the *Times* the other day:—"Notice to British firms. Manufacturers and others wishing to extend their business in New South Wales are invited to make known their wishes to the undersigned, from whom forms for the purpose can be obtained, and to whom all communications should be addressed. The forms when received will be sent to Sydney, where proper inquiries will be made as to the openings for placing the manufactures in which applicants are interested, and the result will be made known to inquirers."

The Council of the Sydney Chamber of Commerce has appointed a Sub-Committee to consider the practicableness of inaugurating a movement to take advantage of the suspension of trade with the enemy countries, and to develop such trade within the Empire and with the other allied nations.

Rawtenstall Employés with the Colours.—Nearly 40 per cent. of the staff at the Rawtenstall Corporation electricity works and about 25 per cent. of the tramwaymen have joined the Colours.

Personal.—Mr. Frank P. Lacey, consulting engineer, has been given a temporary commission in the Royal Garrison Artillery, and the Infirmary Committee of the Salford Board of Guardians has decided to accede to a request by him that on the termination of the war he shall be retained as electrical adviser.

Mr. R. H. Klein, hon. sec. of the Wireless Society of London, although having a name with a somewhat Germanic sound, is a Belgian and a naturalised British subject. He is a Licenciate in Consular Sciences of Antwerp.

Mr. M. C. Shepherd's friends will be interested to know that he is Corporal Instructor in the 14th (Service) Battalion of the Rifle Brigade, in training at Southend-on-Sea. Mr. Shepherd has long been an energetic supporter of National Service, and a promoter of the National Reserve, and has evidently seized the opportunity of bearing his share of the burden. Business will be carried on as usual in his absence.

Col. H. S. Holt, a former partner of Mr. James Swinburne, in Swinburne & Co., has been gazetted major in the Expeditionary Force, and has left for the front. He is attached to the Royal Flying Corps, for the purpose of instructing them in the fitting and use of his reconnoitring parachutes and other inventions.

Mr. John Ridley, who was amongst the survivors of the *Formidable* disaster, was the ship's chief electrician, and was formerly on the staff at the electricity works at Carlisle, where his home is. He entered the Navy about eight years ago, and prior to his transfer to the *Formidable* was on the H.M.S. *Commonwealth*. Before he was rescued he was 21 hours in an open boat. He is safe and well at Lyme Regis.

Mr. A. H. Campling, son of Mr. Frederick Campling, managing director of Messrs. Joslins, Ltd., electrical engineers, Colchester, has been gazetted second lieutenant in the 12th Service Battalion Essex Regiment. Mr. Campling has for several months been serving at Epsom with the Public Schools and Universities Corps.

It is stated that Private Lonsdale's death sentence has been commuted by the Court of Appeal to one of 20 years' imprisonment, but it is understood that he will be released with the other British prisoners at the end of the war.

The Electrical Engineering and Equipment Co., Ltd., inform us that they have three directors—Mr. Bowlby, Mr. Higgins and Mr. Leven. Mr. Bowlby's son is a captain in the Norfolk Regiment, and has been missing for three months; Mr. Higgins is a captain, and has been at the Front for some time, whilst Mr. Leven's two sons are both in the Army, the younger one, Lieutenant Charles Leven, having recently been invalided home. In addition, there are also a number of members of the staff serving in the Army.

Mr. S. W. Carty has just resigned his position as overhead superintendent to the Liverpool Corporation tramways department, and has obtained a commission as a lieutenant in the Army Service Corps Motor Traction Department, where his duties are to control the workshop units attached to the anti-aircraft guns. Mr. Carty held a similar position with the Newcastle Corporation before going to Liverpool, and in both cities he has been secretary to the local Automobile Clubs.

Roll of Honour.—Private W. Macdonald, of the Mechanical Army Service Corps, Highland Division (T.F.), has died at Bedford, aged 20. He was employed as an apprentice electrical engineer with Messrs. Millar Bros., Aberdeen.

Mr. Joseph Dunn, who was for some years employed as a conductor on the Salford Corporation tramcars, has been killed in action.

BUSINESS NOTES.

Consular Notes.—BAGDAD.—In his report for 1913 on the trade of Bagdad, the British Consul-General gives the total value of machinery imported as £169,000, of which £106,000 came from the United Kingdom. This represents a total increase of 62 per cent. over the value during the previous year, the advance being partly due to the inclusion of some railway construction material. Nevertheless, there has no doubt been a real and substantial improvement. As in preceding years, the bulk of the machinery, consisting of irrigation plant, was of British manufacture.

KOBE.—According to the British Consular representative, there was a large increase in machinery imported at Kobe during 1913, the total being approximately £380,000 more than in 1912. This item forms, he says, one of the most satisfactory features in the import returns, and is, moreover, one that must eventually increase in value as industrial development progresses, though the existing depression in trade, and other causes, will probably prevent any notable advance in the immediate future. There is no doubt that the Japanese spinning industry has a bright prospect before it, and that the fast-growing markets in China and Corea will be the cause of still further additions to machinery importation.

As regards electric motors, alternators, &c., the main part of the business was divided about equally between the United Kingdom, United States, and Germany. The completion of the Ujikawa hydroelectric works has to some extent increased the demand for motors for running small power plants. The construction of electric railway systems continues, but most of the orders for equipment appear to have gone to the United States and Germany.

Dissolutions and Liquidations.—THE ELECTRO STEEL FOUNDRIES, LTD, Booth Street, Darlaston.—Under a compulsory winding up order made against this company, the statutory first meetings of the creditors and shareholders were held on January 8th, at the Carey Street offices of the Board of Trade, Lincoln's Inn, W.C., Mr. H. E. Burgess, Official Receiver, presiding. The petition to wind up was lodged by Messrs. Tunbridge & Co., solicitors, Birmingham, on behalf of Mr. Alfred Ernest Owen, The Lawn, Streetley, near Sutton Coldfield. A statement of affairs was presented showing liabilities £3,200, assets valued at £5,000, representing unpaid calls on shares £7,500, and as regards contributories, a deficiency of £3,200.

The company was incorporated as a private company in June last with a nominal capital of £45,000 to carry on the business of iron, steel and brass-founders, casters, moulders, and metal-workers, the object being to work a particular electrical process of steel manufacture which had been successfully worked in Germany. The promoters were Mr. Francois Victor Bernand, electrical engineer, of Houldsworth Wood, who was to act as managing director for six years, at a salary of £500 per annum, and Mr. Alfred Ernest Owen, the petitioner. The issued capital was £30,000, the whole of which was subscribed for in cash and called up to the extent of 5s. per £1 share. An agreement was entered into on July 22nd, 1914, between the Rheinische Electrostahl Werke, of Bonn, on the Rhine, Mr. Owen, and the company, whereby the German Co. agreed to supply instructions and drawings for laying down plant for the manufacture by a special process of electric steel castings; to supply certain Electrostahl furnaces, and to apply for the allotment of £10,000 shares in the company. Mr. Owen being the proprietor of land at Darlaston agreed to sell a certain part thereof to the company and to apply for the allotment of £20,000 shares, which were issued as to £17,000 to Mr. Owen and £3,000 to Mr. Bernand. The outbreak of hostilities made it impossible for the German Co. to carry out the agreement, and the company is unable to enforce payment of the call upon them in respect of the £10,000 shares. Mr. Bernand issued a writ against the company for salary as managing director, and proceeded to judgment, whereupon Mr. Owen took the necessary steps to protect himself, and presented the petition to wind up the company. The failure is attributed by its officials to the European crisis, whereby the persons connected with the German Co. became alien enemies, which prevented the objects of the flotation being carried into effect. The Chairman remarked that this was essentially a case for the parties to come to an amicable settlement, seeing that the general public were not involved in the proceedings, and he counselled a friendly meeting, at which, if necessary, he would give them any advice or assistance. Mr. Owen and Mr. Bernand appeared to endorse that view, and by general consent the liquidation was left in the hands of the Official receiver.

THE GENERAL ELECTROLYTIC PARENT CO, LTD.—This company is winding up voluntarily with Mr. J. Barron, of Middlewich, as liquidator. A meeting of creditors was held on January 14th.

THE DRY GAS ELECTRIC FIRE EXTINGUISHER CO., LTD.—A meeting will be held on February 11th, at 109, Colmore Row, Birmingham, to hear an account of the winding up from the liquidator, Mr. H. Keeling.

GRINDELL MATTHEWS WIRELESS TELEPHONE SYNDICATE, LTD.—Liquidator (Mr. H. Woodburn-Kirby Bassishaw House, Basinghall Street, E.C.) released December 16th, 1914.

MESSRS. W. J. CLENT and J. R. HALLIWELL, flash lamp battery makers and commission agents, 19A, Corporation Street, Manchester, who have traded as W. J. Clent & Co., have dissolved partnership. Mr. Halliwell is continuing the business under the style of Halliwell & Co.

Sending Receipts on Account.—In the City of London Court, on Thursday last week, before Judge Rentoul, K.C., in the case of Minchin *v.* Strauss, plaintiff, Mr. W. S. Minchin, 20, Hanover Square, claimed £8 2s. 6d. against the defendant, Mr. Julius Strauss, 32, Seething Lane, for the balance of £40 for trade goods supplied. Mr. Woodgate appeared for the plaintiff, Mr. Beechcroft for the defendant. Mr. Woodgate said that defendant disputed that goods to the amount of £40 had been supplied or work done and sent the plaintiff a cheque for £32 1s. 11d. "in full settlement of account." Plaintiff accepted the cheque, waited until it was cleared, and then wrote and said he did not accept the condition on the cheque, giving a receipt "on account."—Mr. Beechcroft said there was a *bonâ fide* dispute about the balance deducted, but defendant would not go into that now, as the time and trouble involved would be out of all proportion to the amount at stake. They had had three different accounts from the plaintiff. Plaintiff could not retain the cheque, pay it in, and then say he would not accept the condition attached to it. Plaintiff gave no opportunity to the defendant to withdraw his cheque when he said he would not accept the condition. A cheque was not money, but a negotiable instrument for money. If a man did not accept the condition the only honest course was to give the defendant a chance to take back his cheque.—Judge Rentoul agreed that that would have been better, but plaintiff would have been out of the bulk of his money for some months if he had done that.—Mr. Woodgate urged that plaintiff was quite within his rights and within the legal decisions.—Judge Rentoul agreed and found for the plaintiff, with costs.

Catalogues and Lists.—THE SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, London, W.C.—Two booklets: No. 264, a 12-page pocket pamphlet, in which are illustrations and prices of a new range of "Electric Cooking Apparatus de Luxe," especially for table use (kettles, water-heaters, grill, toaster, boiling-ring and irons); and No. 263, which is an 8-page priced publication showing a number of their registered designs of British-made fittings for half-watt lamps, the majority with opalescent globes, but two with Holophane glassware.

MESSRS. MARPLES & LEACH, 26-30, Artillery Lane, London, E.C.—Eight-page stock list of C.C. and A.C. motors, dynamos and portable electric tools in London ready for delivery.

MESSRS. ELECTRIC INSTALLATIONS, LTD., 27 and 28, Martin's Lane, Cannon Street, London, E.C.—Folder relating to intercommunication telephones for business premises, and a list of installations supplied by the firm.

MESSRS. J. H. HOLMES & CO., Newcastle-on-Tyne.—Pamphlet No. 37 gives particulars, prices, code-words, &c., for ironclad oil-break switchgear for mining and sub-station work.

MESSRS. A. P. LUNDBERG & SONS, 477 to 489, Liverpool Road, London, N.—Ten-page pamphlet (No. S 24), containing very full and illustrated matter relating to their various types of ceiling roses —"Biflex," "Detachable," "Triflex," "Quadruflex," "Multiflex," and "M.I.P." Prices are stated, and examples of their uses given.

THE EDISON & SWAN UNITED ELECTRIC LIGHT CO., LTD., of Ponder's End., have prepared some most artistic and effective transparencies for fixing to their customers' windows, show-cases, &c., in all parts of the country. Reproduction here would hardly do it justice—it requires to be seen printed in colour—but for the purpose for which it is intended it must be an excellent advertising agent for Royal Ediswan drawn-wire lamps.

THE GENERAL ELECTRIC CO., LTD., 67, Queen Victoria Street, London, E.C.—Leaflet No. H 1,882 gives some particulars of the "County" half-watt lantern with Holophane globe.

Bankruptcy Proceedings.—S. BROOKES (The Netherton Tube Fittings Co.), tube fittings manufacturer, Netherton, Dudley).—Discharge suspended for two years, on December 8th, 1914.

GEORGE EDWARD HIPKINS, electrical engineer, 11, Bath Street, Dudley, appeared at the Dudley County Court last week for his public examination in bankruptcy. The liabilities were set down at £510, and the deficiency at £386. Debtor attributed his failure to "loss on picture palaces, loss on trading through the war, law costs, and interest on borrowed money." The examination was subsequently adjourned to close

Book Notices.—*The Electrical Engineer's Diary for 1915.* Edited by J. H. Johnson. London: S. Davis & Co. Price 3s. 6d.—Whilst the bulkier portion of this volume is certainly a diary, interleaved with blotting paper, the remainder is a reference book containing a mass of useful information with regard to electricity supply and electric lighting, heating, cooking, and power. In addition to a collection of tables and data of general application, and the principal sets of official regulations, there are sections dealing with power station plant and management, illumination, and domestic uses of electricity, and a valuable set of tables on the power required for a great many industrial applications of electrical energy. A list of London streets in which electric mains are laid forms a unique feature of this publication, and a list of electricity supply authorities in the United Kingdom is included. Altogether it is a very creditable production, and should prove useful to a wide range of electrical men.

Magnets and Electric Currents. By J. A. Fleming, F.R.S. London: E. & F. N. Spon. Price 3s. 6d. net.—It is generally reckoned that electrical books are obsolete when they are, say, 10 years old, owing to the rapid march of progress; happy, therefore, are the publishers, and proud should be the author of one which, first published 17 years ago, can now be re-issued apparently without the least alteration except in the preface and the title-page. In passing, we may point out that in both places it is referred to as the third edition; this is hardly correct, as it is, strictly speaking, only the third *impression*. Prof. Fleming states, in explanation of the absence of change, that the book "deals with the fundamental and elementary principles on which Electrical Engineering is based, and these are not subject to variation"; this is true in the main, but it is not advisable to go too far along these lines. For instance, nomenclature changes, and we do not now speak of "micrometres," but microns, nor are the abbreviations grm. and kgr. recognised; the weber as the unit of magnetic flux is not in general use, and the accepted value of the British thermal unit is not 779, but 778 ft. lb. The "modern two-pole dynamo" illustrated on p. 349 was modern 17 years ago, but, like most of the commercial apparatus illustrated, it is now ancient. We praised this book when we reviewed it in 1898; and—it *was* a good book.

The Kinematograph Year-Book, Diary and Directory for 1915 (London: *Kinematograph and Lantern Weekly*) is an interesting and useful volume, which, by its bulk, affords some indication of the extraordinary development of the new industry which has so quickly established itself amongst us; the directory alone occupies 100 pages, and includes particulars of the systems and voltages of electricity supply throughout the United Kingdom. Moreover, this is only the second issue of the year-book—yet it contains a mass of information on all matters connected with the picture play that does great credit to the producers. The industry may justly claim to be inseparably associated with electricity supply, seeing that the electric arc is almost invariably used as the source of light, and the theatres are usually electrically lighted; we are therefore interested in its prosperity, which may be gauged by the fact that during 1914 500 new companies were registered and 300 new theatres were opened in Great Britain. A large number of the establishments are called "Electric Theatres." The year-book contains a note concerning new electric lamps, and we regret to notice that the invention of the half-watt lamp is ascribed to Germany; this is wholly erroneous, the lamp having been developed entirely in the United States. The early work of Mr. R. W. Paul, the pioneer of the kinetoscope in this country, as well as of the kinematograph, is described, and the book is illustrated with numerous excellent half-tones from films, admiring which has prevented us from making further notes on the literary contents.

Willing's Press Guide for 1915 has made its appearance. It is published at the popular price of one shilling, at 125, Strand, W.C. On the whole, it is a very serviceable directory, but it ought to be more accurate in its entry, in "Metropolitan Newspapers" section, relating to the date of an electrical contemporary's birth.

"How to Pay for the War." By Wilfrid Stokes.—London: British Engineers' Association. 6d.

"*Proceedings* of the Physical Society of London." Vol. XXVII, Part 1. December, 1914. London: The *Electrician* Printing and Publishing Co.

"Science Abstracts." Sections A and B. Vol. XVII, Part 12. December 30th, 1914. London: E. & F. N. Spon, Ltd. Price 1s. 6d. each net.

Trade Announcement.—Messrs. Mossay & Co., Ltd., have removed from Horseferry Road to Queen Anne's Chambers, Westminster, where they are continuing their engineering business. As already announced, they have made arrangements with Messrs. Ransomes, Sims & Jefferies, Ltd., of Ipswich, for the manufacture to their designs, of electrically-driven vehicles. Under these arrangements Messrs. Mossay are also acting as selling agents for these vehicles in the United Kingdom, and all inquiries relating thereto should be addressed to them. The first series of chassis is already in hand, and early deliveries can be given.

Canada.—The *Times* states that an important new steel plant, owned by the Armstrong, Whitworth Co., of Canada, Ltd., is now in operation at Longueuil, opposite Montreal, in the Province of Quebec. About 200 workmen will be employed at the outset, under the supervision of experts from British works. For the present the company will confine its operations to the manufacture of high-grade crucible steel for machine tools.

Private Arrangements.—Redglo, Ltd., 647, Royal Liver Buildings, Pier Head, Liverpool, and 34, Great Ancoats Street, Manchester, electrical stove manufacturers.—Pursuant to Sec. 188 of the Companies' (Consolidation) Act, 1908, a meeting of the creditors herein was held at Liverpool last week, when a statement of affairs was presented showing liabilities amounting to £548 and net assets estimated to realise £599, the estate disclosing an apparent surplus. It was reported that the company was formed 18 months ago, with a capital of nearly £1,000. The trading up to the present time amounted approximately to £855, while the sales of patents amounted to £1,500. It was explained that the greater portion of the loss was owing to the initial expenses in the formation of the concern. The patentee, Mr. Martin, was at present on active service, and the business was being conducted by the liquidators, Mr. Ernest J. Walker, of Messrs. Lloyd Walker & Evans, and Mr. P. Hutchinson, a creditor. Mr. Hutchinson stated that he had several purchasers in view for the patents, and it was hoped that ultimately the creditors would receive 20s. in the £. It was decided that the matter should be left in the hands of the joint liquidators. The following are creditors:—

Hutchinson, P.	£232	Evans, E. W.	£17
Lloyd Walker & Evans	21	Peyton & Peyton, Ltd.	17
Winfane Art Metal Co.	20	Tyreman, W. H.	18
Simpson, North & Co.	22	Drinman & Cooper	15

Foreign Electrical Trade in 1914.—The *Chamber of Commerce Journal*, in the course of its trade review for last year, gives the following figures showing the course of the export and import trade in electrical goods for the eleven months ended November 30th, 1913 and 1914:—

Exports.

	1913.	1914.
Electrical goods and apparatus (other than machinery and uninsulated wire)—		
British	£5,058 207	£2,833,330
Foreign	220,719	176,670
Electrical Machinery—		
British	24,873 tons.	23,679 tons.
	£2,076,092	£2,040,578
Foreign	711 tons.	461 tons.
	£86,495	£63,195

Imports.

Electrical goods and apparatus (other than machinery and uninsulated wire)	£1,431,771	£1,152,017
Electrical machinery	1,223,501	1,353,851
" "	10,433 tons.	11,178 tons.

Trade Openings in Buenos Ayres.—With a view to increasing Italian exports to Buenos Ayres, the Italian Chamber of Commerce in that city has instituted an inquiry, and formulates the following list of articles for which there is a demand in the Argentine market:—Electric motors, dynamos, explosion engines required in electric stations, accumulators, malleable steel and iron tubes for internal wiring, with accessories, metal-filament lamps, and armatures for same, 220 and 240-volt current-breakers, and general accessories for electric installations. The requisites for successful sales are: moderate price, æsthetic appearance, judicious advertising, choice of expert representatives having good *clientèles* and of good repute, having a knowledge of where to grant facilities for payment. The factors which have worked against foreign, and particularly Italian trade, have been lack of discernment in the choice of agents, smallness of the means placed at the agents' disposal, lack of initiative in the agent, and oftentimes lack of knowledge of the branch of goods handled, at times also too little liberty and too exacting contracts, too much exigence on the part of manufacturers and absence of facilities for payment. Packing and forwarding are governed by the article and the transport convenience available, and also the Customs regulations, which in some cases are fixed by weight and in others by number. Packing itself should be the object of special study, as upon it depends the good condition of the articles on arrival, and therefore of the higher or lower scale of cost. The conditions of payment usually exacted by German houses is 90 to 180 days in shipping documents, paid by bills drawn on German branch banks, without interest. As the effect of the war will be to paralyse for an indeterminate period the industry of many countries, and especially of Germany and Austria, the former hitherto enjoying a large share of Argentine trade, the present time affords an excellent opportunity for other countries to forward their goods and secure a footing in the progressive Argentine market.

Australian Tariffs.—Various representations were made to the Inter-State Commission in Melbourne recently for alterations in the tariff with respect to electrical apparatus. Mr. W. J. Mountain, secretary to the Melbourne Electric Supply Co., applied for a reduction of the duty on electrical incandescent lamps. These lamps (he said) were not made in Australia, though they provided the most hygienic light. The duty on them hindered their sale. Mr. F. W. Clements, chief engineer to the Melbourne Electric Supply Co., asked for a reduction of the duty on electric generators for direct coupling to steam turbines. Mr. James Wilson, manager of the British General Electric Co., Sydney, asked for a British preferential tariff of 10 per cent. on certain electrical appliances. There had been very serious competition to contend with (he said) from America and Continental manufactures. Continental manufacturers did not supply goods nearly up to the British standard.—*Australian Mining Standard.*

Calendars and Diaries. — THE DIAMOND COAL-CUTTER CO., Wakefield.—A wall calendar with monthly slips has been issued. A Diamond cutter figures in the design.

From the DUSSEK BITUMEN CO., of Empress Wharf, Bromley, E., we have received as usual a very presentable pocket diary with card and letter case, and insurance coupon. We are interested in the general information which it contains, especially where there are some "Things One Wants to Know." That it is copyrighted by Collins' clear-type Press relieves the Dussek Co. of responsibility, and the war exonerates both, but one of the things that one very much "wants to know" is that the income-tax is "1s. 2d. in the £." We certainly want to know that more than that "an airship going at 50 miles per hour would take 210 years to reach the sun from the earth," though there is some timely interest in the fact than an inch of rain means about 100 tons per acre, and far more in the inspiring statement that February is one of the driest months of the year. We congratulate the Dussek Co. on continuing to issue a most acceptable pocket souvenir.

From THE ELECTRO-MOTOR HIRING, LTD., of Greenmount Works, Halifax, there has come to hand a wall calendar with monthly slips. The design is a Union Jack in colour forming a background for five half-tone illustrations of Wright & Wood motors.

A very serviceable and clearly-printed calendar with monthly sheets for 1915 has been received from the SELSON ENGINEERING CO., LTD., of 85, Queen Victoria Street, E.C.

Crane Contracts for India.—Amongst the Government orders recently received by MESSRS. PYNE, HUGHMAN & CO., engineers, of London and Calcutta, are the following :—

Thirteen 2-ton electric goods lifts for the new sheds now being erected by the Port Commissioners, Calcutta, north of the Howrah Bridge, amount of contract over £6,000. These lifts are being manufactured by Messrs. A. & P. Steven, of Glasgow, for whom the firm are agents. The Port Commissioners have also placed an order with the same firm for 11 2-ton electric roof cranes for the new sheds and jetties being built at Garden Reach, amount of contract over £12,000. These cranes are being manufactured by Messrs. Geo. Anderson & Co., of Carnoustie.

A repeat order has also been placed with Messrs. Pyne, Hughman and Co. for a further 19 electric cranes (13 semi-portal and six roof cranes) amount of contract over £24,000. The cranes in this instance are being manufactured by Messrs. John Grieve and Co., of Motherwell.

Warsaw.—H.M. Consul reports that a local firm wishes to get into touch with United Kingdom manufacturers of electrical goods, such as dynamos, fans, lighting accessories, installation materials, telephones, bells, &c. The names can be ascertained at the Commercial Intelligence Branch of the Board of Trade, London, E.C., but further communications should be addressed to the British Consulate, Warsaw.

LIGHTING and POWER NOTES.

Aberdeen.—During November, 1,138,140 units were generated at the Corporation power station, an increase of 63,250 units compared with the corresponding month in 1913.

Argentina.—It is reported that the electric lighting company has notified the Municipality of Mar del Plata of its decision to suspend the public lighting service at the end of the present month, owing to the Municipality having made no payment for the last 1½ years' service. The residents of Dolores are protesting against the excessive charges of the Italo-Argentine E.L. Co., and a technical inspector is to be appointed.

It is proposed to construct electricity works at Irigoyen (Santa Fé), which would also supply Barrancas, Diaz and Casalegno.—*Review River Plate.*

Australia.—The Parramatta Council has concluded a contract with the Parramatta Electric Lighting Co. for the lighting of the town by electricity.

The Mount Lyell Power Co.'s hydro-electric scheme is now nearly completed. At the blower house at the smelters four electrically-driven turbo-blowers, each of 25,000 cb. ft. capacity, and two of 3,500 ft. capacity, have been installed, with satisfactory results.

The Sydney Municipal Council has authorised the city electrical engineer, in view of the possible necessity for additional plant required to meet the demand for electricity in the winter of 1915, to prepare specifications for two 12,000-KW. turbo-generators and the boiler house equipment necessary to provide steam for one of these machines.

At Wollongong (N.S.W.) the installation of an electric plant at Mount Pleasant colliery is being proceeded with, and a transmission line for three-phase current is being erected. It is stated that in a few months there will be energy produced at this colliery far beyond its own needs, and the company will, no doubt, be prepared to supply outside consumers.—*Tenders.*

Bacup.—STREET LIGHTING, &C.—The Lighting Committee has accepted the terms of the electricity department for electric lighting of street lamps—34s. per annum plus 3s. 6d. for each 1,000 hours during which the lamps are lighted.

The Electricity and Tramways Committee has resolved that in respect of installation work executed by the Corporation on private consumers' premises, a charge of 10 per cent. above actual cost price be made for establishment charges, supervision, management, wages, &c., and, where specifications, quantities, &c., only are prepared, and the works not carried out by the Corporation, a charge of 5 per cent. on the estimated cost be made.

A scheme for lighting the fire station by electricity has been approved.

Bath.—The E.L. Committee recommends that Messrs. Mirrlees, Bickerton & Day, Ltd., be asked to inspect the Diesel engine at the works and to submit their suggestion for altering, completing and reassembling the same, together with an estimate of the costs.

Blackrock (Co. Dublin).—L.G.B. INQUIRY.—Mr. P. C. Cowan, of the Irish L.G.B., will hold an inquiry on 26th inst. into the U.D.C.'s application for sanction of a loan of £13,000 for an electric lighting scheme.

Bridlington.—The T.C. has decided to seek the approval of the L.G.B. for the use of a site adjoining the electricity works for the erection of a dust destructor.

Boston.—E.L. SCHEME.—The T.C. has asked the B. of T. to receive the deputation to discuss the option of purchase to be given to the Council, and the maximum price to be charged for current, under a prov. order being applied for by Mr. Robert Arthur Smith. The Council has received the sanction of the L.G.B. to a loan of £3,600 for the erection of a refuse destructor.

Cheltenham.—STREET LIGHTING, &C.—The Electric Lighting Committee has reduced the charges for street lighting by £500, and transferred £352 from the profits to the relief of the rates.

Chingford.—PROV. ORDER.—The U.D.C. has decided to withhold its consent to the prov. order for electric supply being applied for by the County of London Electricity Supply Co.

Clacton.—NEW BATTERY.—The Council has decided to install a new battery at the electricity works, at a cost of £1,684. The Electricity Committee's report on the past year's working showed steady progress, the gross profits being £360 more than in the previous 12 months, whilst £114 was carried forward, as against £24 in the previous 12 months.

Continental.—HOLLAND.—A concession has been granted to the Province of Overijssel for the construction and exploitation of works for the supply of electricity.—*Board of Trade Journal.*

Dartford.—The Electric Lighting Committee has resolved to petition against the London Electric Supply Bill.

Denton.—PUBLIC LIGHTING.—The U.D.C. has decided to have the bandstand in, and entrances to, the park lighted by electricity, the cost to be included in the estimates for the ensuing year.

Doncaster.—SALE OF FITTINGS, &C.—At the statutory meeting of ratepayers to consider the provisions of the Corporation's Parliamentary Bill, a resolution was moved, on behalf of the Tradesmen's Association, for the deletion of clauses empowering the Corporation to sell meters and fittings connected therewith, and to sell, let for hire, and fix, &c., electric fittings and appliances. On behalf of the Corporation, it was contended that the municipality were, in the clauses, endeavouring to protect the interests of individual traders as against trusts and big companies. The deletion of the clauses was agreed to by a large majority.

Edinburgh.—EFFECT OF WAR.—An interesting statement as to the effect of the war on the electric light undertaking has been made by Councillor Stevenson, who said their revenue was heavily hit, due to the restricted public lighting on the one hand and the modified private lighting, but during the seven months since May last they had connected 97,507 8-C.P. lamps, while during the whole of the year 1913-14 they had only connected 148,027 lamps, so that in spite of the war the figures showed that the business had been growing more rapidly than in the previous year.

Essex.—The County Council has decided to oppose in both Houses of Parliament the Bills of the London and District Electric Supply Co., the Woodford and District E.L. Co., and the two London Electricity Supply Bills.

Farnham (Surrey).—A Committee of the Council having made inquiry of the Gas Co. as to an extension of cables to the Hale Ward, has been informed that the demand for current would not be sufficient to justify the expenditure. It has therefore been decided that inquiries be instituted by the Council with a view to securing a supply of electricity otherwise than through the Farnham Gas and Electricity Co., upon terms which will impose no undue burden upon the existing rates. One Councillor remarked that they might just as well remain in the dark as have the gas at present being supplied.

Gillingham (Kent).—SCHOOL LIGHTING, &C.—Owing to consumers not being allowed to use outside lamps, the T.C. has decided to reduce the charges for hire during the period of non-use to 1s. each per quarter, and to make no charge for the hire of the meter during that period. At the request of the secretary to the Education Committee, a report is to be prepared on the installation of the E.L. at five non-provided schools in the borough, on the basis of the Education Committee paying for current at a rate covering the cost of the installations and the hire of fittings.

Glastonbury (Somerset).—PROV. ORDER.—At a meeting of the T.C. the town clerk reported the deposit of plans and notices with regard to the proposed E.L. order for which Messrs. Christy are applying, and it was decided to ask that the compulsory area should be enlarged.

Greenock.—Loan Sanction.—The Corporation has been notified that the Secretary for Scotland has given his sanction to the application to borrow £30,000 for the electricity undertaking.

Hayward's Heath.—Prov. Order.—The U.D.C. has decided to request the B. of T. to grant an extension of time for carrying out the prov. order for E.L. granted to the Mid-Sussex E.L. and P. Co., Ltd.

Hazel Grove and Bramhall.—Proposed E.L. Scheme.—The U.D.C. has decided to engage Mr. T. L. Miller to report upon a scheme of electricity supply for the Council's district, at a fee of 25 guineas, plus out-of-pocket travelling expenses.

Henley-on-Thames.—Prov. Order.—The T.C. has empowered the town clerk to take the advice of the Parliamentary agents before any further steps are taken respecting the prov. order for E.L. being applied for by the Reading Electric Supply Co.

Hereford.—The T.C. has applied to the B. of T. for consent to the supply of current along a route in the city, by overhead lines at a pressure of 440 and 220 volts.

The R.D.C. has consented to the T.C. supplying electricity to Tupsley Court, which is outside the borough, subject to cables passing along or across any highway being placed underground.

Holme.—The U.D.C. has considered the Bill of the Yorkshire Electric Power Co., and has decided to ask for an assurance that the Bill will not prevent the Council or a local company from running an electric plant in Holme.

Holmfirth.—E.L. Scheme.—B. of T. sanction has been received to the scheme of the Council for supplying electricity.

Hove.—Plant Extensions.—It is proposed to install a 500-kw. mixed pressure turbine set, a new battery, booster sets and switchgear at the Leighton Road Works. Superheaters would also be fitted to the boilers, and the engineer estimates an improvement of the efficiency of the present plants of some 20 per cent. The estimated cost of the work is £6,970. It is suggested that energy be supplied to local wiring contractors, for showroom purposes, at 3d. per unit.

Keighley.—Half-watt Lighting.—It has been decided to erect two additional 2,000-c.p. half-watt lamps in East Parade, the annual cost for current and maintenance being estimated at £10.

Kingstown.—On Thursday, last week, in London, Mr. S. L. Brown, K.C., as Arbitrator, opened the proceedings in connection with the amount to be paid as compensation by the Kingstown U.D.C. to the Dublin Southern District Electric Supply Co. under a prov. order obtained in Parliament last Session for the transfer of the undertaking to it within six months on its paying the expenses incurred by the promoters.

Lees.—Proposed E.L.—With reference to the promotion of a Bill by the Stalybridge Joint Board seeking powers to extend its supply of electricity to Lees, and other districts, the Oldham T.C. has appointed a special sub-Committee to confer with the Lees D.C. on the matter.

Limerick.—Proposed Loan.—The Corporation has made an application to the L.G.B. for sanction to a loan of £5,000 for additional plant and machinery at the electricity works, and the inquiry will be held on the 22nd.

Liverpool.—Electrical Pumping.—It has been decided to replace the drainage pump at the Canada Graving Dock pumping station by a larger one, electrically driven, at a cost of £550.

London.—Greater London Supply Scheme.—In view of the opposition, most prominent on the part of Borough Councils who are electric suppliers, to its scheme, the L.C.C. has appealed to such Councils for their views on the advisability of obtaining uniformity and establishing a bulk supply, and asking on what terms the Councils would support the Bill. The Hammersmith B.C. has intimated, in reply, that it cannot support the Bill.

Hackney.—The B.C. is recommended to present petitions against the London and District Electricity Supply Bill and the London Electric Supply No. 2 Bill.

Battersea.—The B.C. has been advised that the Port Authority has fixed the rental of the suction and discharge pipes in the Thames in connection with the water-condensing plant at the generating station, at £75 per annum for a period of five years.

Lytham.—The Bulk Supply Proposals.—The St. Annes and Lytham's Councils have not been able to come to terms in connection with the bulk supply of electricity. The St. Annes Council has now declined to admit the right of the Lytham Council to supply electrical energy to the Tramways Co. in Lytham after June, 1917, and has intimated that as it sees no hope of arriving at a mutual understanding, it is not disposed to discuss the matter further, and was willing, if Lytham assented, to drop the agreement altogether. The Lytham Council has now written to St. Annes stating that the papers have been sent to their Parliamentary agents for them to arrange for a reference to counsel of the differences between the two Councils.

Maidenhead.—The T.C. has agreed to supply current to the motor works of G.W.K., Ltd., who, it is anticipated, will pay at least £300 a year for energy.

Nelson.—The T.C. has approved a proposal to give a supply of current to Barrowford, and the electrical engineer is to prepare estimates, &c.

Newcastle West (Co. Limerick).—E.L. Scheme.—It was reported to the T.C. that the ratepayers had decided by a large majority in favour of the lighting of the town by electricity, and the clerk was directed to communicate with Mr. Wm. Phelan in reference to a scheme submitted by him.

Oldham.—Heating Tariff.—The T.C. has reduced the price of electric energy in the town for cooking and heating purposes to a flat rate of 1d. per unit.

Randalstown (Co. Antrim).—Camp Lighting.—The military camp lately constructed here is to be lighted by electricity supplied locally, the adjacent river providing the power for the local lighting and the camp.

Ripon.—Camp Lighting Scheme.—In connection with the arrangements which are being made for the reception of a large number of soldiers at the military camp, it is intended to install an electric lighting plant and to erect a power station near the Pateley Road. The Corporation is to have the opportunity of a supply in bulk and to undertake the distribution, with possible eventual purchase of the power station.

Salford.—L.G.B. Inquiry.—An inquiry was held on January 8th into the application of the Corporation to borrow £22,910 for new plant and equipment, and for an extension of the Frederick Road electricity works. There was no opposition, and the inquiry closed.

Sevenoaks.—The R.D.C. has decided to formally oppose the London Electricity Bill in order to permit of action being taken.

Skelton and Brotton (Yorks.).—Supply Inaugurated.—The supply of electrical energy by the Council under its lighting order of 1913 was officially commenced on January 1st, and on the same day the ordinary lighting consumers of the Cleveland and Durham Electric Power Co. in Carlin How were taken over by the Council's undertaking. The area of supply contains a population of about 16,000 inhabitants, and embraces half-a-dozen distinct parishes somewhat widely separated from one another. On economic grounds, therefore, overhead lines have been adopted almost exclusively, only a small length of underground mains having been used for a few special "crossings." A bulk supply is taken from the Cleveland and Durham Power Co. at high pressure at several sub-stations and there transformed by the Council. The general supply is given on the four-wire three-phase system with a frequency of 40 periods and at a pressure of 250 volts for public and private lighting, and 440 volts for power purposes. A small section of the lighting supply in the parish of Carlin How hitherto given by the Power Co. at 110 volts is being maintained at that pressure. Solid copper wires are used throughout, the sectional area of the main line being ·05 sq. in. for each of the three-phase wires and ·025 sq. in. each for the two neutral wires. The public lighting and small branch lines are mainly No. 11½ S.W.G. with a split neutral of the same section. The greatest span on the line is about 180 ft., and the average 140 ft., the height of the wires above ground being 22 ft. The lines are protected by lightning arresters fixed at the various sub-stations. Both steel and wood poles have been used, the latter being restricted to the more rural roads in the district. Each pole is fitted with a double safety cradle formed of No. 3 copper wire connected to the neutral wires, and insulated from the supports. Special "cradling" has been provided where the lines cross railways and telephone and telegraph wires. The length of route provided with distributing lines is about 16 miles. The sub-stations are equipped with Berry transformers, B.T.H. high-pressure switchgear and Westinghouse low-pressure switchgear. All the public street lamps, numbering close upon 400, are being electrified with "Mazda" lamps, the poles carrying the lines being utilised for the fittings. The lamps are controlled by special line wires and Venner time switches. Only a part of the public lighting has yet been started. Messrs. Graham Bros., of Middlesbrough, were the contractors for the overhead lines, sub-station equipment, switchgear and public lighting fittings. Messrs. May and Hawes, of Westminster, are the consulting engineers for the scheme, and they have also been appointed by the Council as administrative engineers of the undertaking for a period of 15 months from the commencement of the supply, with authority to appoint the necessary staff and conduct the working operations of the undertaking. Mr. George Dixon is their resident electrical engineer. The rates of charge fixed by the Council are as under:—Lighting, 4½d. per unit for the first 100 units per quarter, and 4¼d. for additional units; power and heat, 2d. per unit for the first 100 units per quarter, and 1½d. for additional units. A minimum quarterly charge for metered supply is 5s. Slot meter supplies are available for premises of a rateable value not exceeding £20, with installations not exceeding 500 watts at 5½d. per unit, while contract supplies are given under special conditions to premises of a rateable value of not exceeding £20, at an inclusive charge of 7d. per week for an approved installation of not more than five lamps, with an additional charge of 1d. or 2d. per week for each additional 20 or 40-watt lamp respectively. Already over 250 private consumers are being supplied, many of them on the contract principle for a fixed inclusive weekly payment according to the number of lamps installed, a method of supply which the Cleveland miners appear to appreciate.

(*Continued on page* 83.)

RECENT DEVELOPMENTS AT THE SALFORD ELECTRICITY WORKS.

THE Frederick Road generating station of the Salford Corporation electricity department will live in the memory of those who were familiar with it as it appeared a few years ago, if only for its imposing vistas of medium-speed reciprocating sets and Lancashire boilers.

These works which were established in 1902, and described in our pages at the time, had a total plant capacity of 6,400 KW. of direct-current generators, supplemented by batteries of 270 KW. capacity on a three-hour discharge; the station was erected at the time when the electrification of the Corporation tramway system was being carried out, and it superseded the little single-phase alternating-current plant which represented the Corporation's first venture in electric supply works.

Since that time the demand for electrical energy in the area, which is a purely industrial one, has advanced at a great rate, and the 1¼ million units output of 1902 has expanded to 20 millions, of which about 8 million units represent the tramway demand. There are, at the present time, some 16,700 H.P. of motors (exclusive of tramway motors) connected to the mains, including over 5,300 H.P. of hired motors.

In the interval three 1,000-KW. direct-current turbine sets and a battery with a three-hours' discharge capacity of 675 KW. have been added to the original equipment, and more recently—in 1913—owing to the insufficiency of plant to meet the winter demand and the necessity of doing something, an agreement was entered into with the Lancashire Electric Power Co. for a bulk supply up to 3,000 KW. for a period of three years.

It was realised, however, that the whole question of future supply would require to be dealt with on a comprehensive scale if the growing demand for cheap electricity for power purposes was to be successfully met, and that this would necessitate the introduction of large turbine plant and H.T. three-phase generators and distribution to sub-stations in the borough, and the Electricity Committee, faced with the alternatives of re-equipping the Frederick Road station on modern lines, or erecting an entirely new one, has made a first installation of three-phase plant at the existing station to meet immediate requirements, although we understand that no final course has been definitely adopted. Thus, on the advice of Mr. J. A. Robertson, the borough electrical engineer, it was decided in June last to place the order for a 5,000-KW. three-phase turbo-alternator, to make room for which one of the original 800 KW. direct-current sets was removed. The new turbine plant, which we illustrate in fig. 1, was supplied by the British Westinghouse Co., and officially started up on December 2nd last.

It consists of a Westinghouse-Rateau impulse turbine running at 1,500 R.P.M., driving a 6,600-volt, 50-cycle alternator of the compensated type and an exciter on the end of the main shaft, together with surface-condensing plant below, the necessary space to accommodate the latter having been obtained by mounting the new turbine some 12 ft. above the original engine-room floor level.

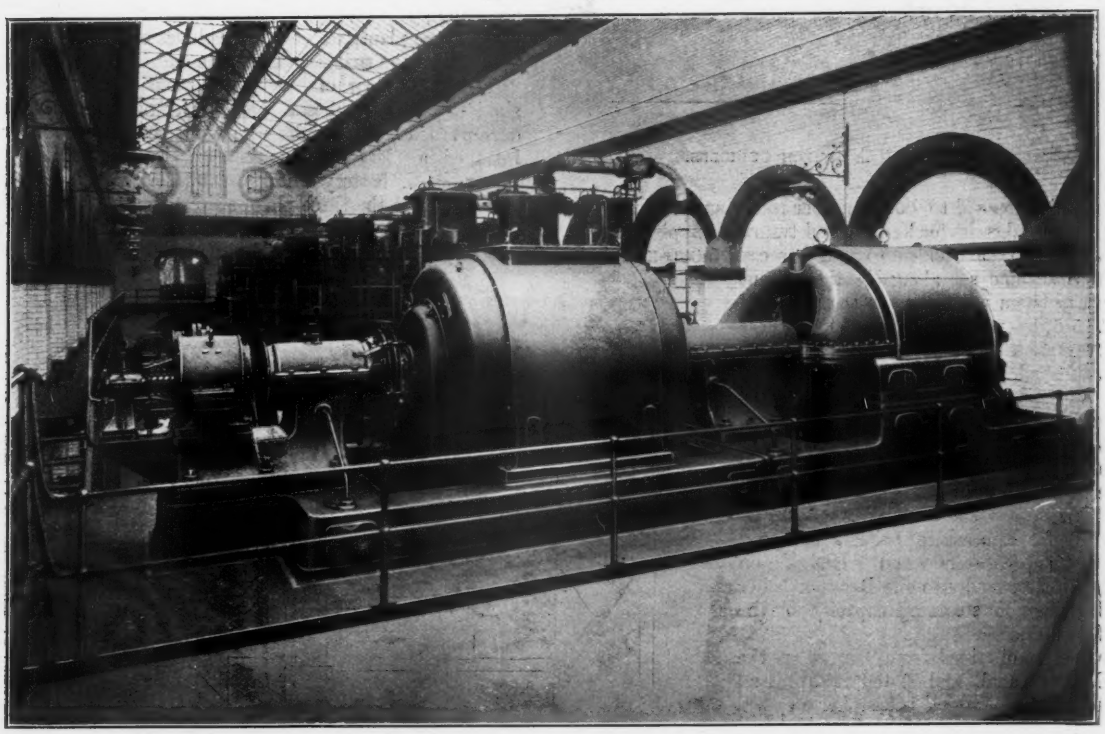


FIG. 1.—INTERIOR OF THE FREDERICK ROAD GENERATING STATION OF THE SALFORD CORPORATION, SHOWING 5,000-KW. TURBINE SET IN FOREGROUND.

The condenser is designed for a normal vacuum of 27½ in. on full load, and is provided with two sets of air and extraction pumps, each driven by a 35 H.P. steam turbine running at 2,500 R.P.M., and each capable of doing the whole load. The circulating pump is driven by a 50 H.P. motor running at 475/545 R.P.M.

A view of the condenser auxiliaries taken from engine room floor level is shown in fig. 5.

The three-phase switchgear in connection with the new turbine and rotary converter plant, the latter installed for the bulk and local supply, has been supplied by the British Westinghouse Co., and consists of oil-switches in brickwork cubicles, situated in a switch chamber at one side of the engine room, and operated by electrical remote control from a control board in the main switch room at one end of the engine room.

The transforming plant installed at Frederick Road works consists of three 1,000-KW. G.E.C. and two 750-KW. Westinghouse rotary converters and transformers, while in connection with the outside supply a sub-station is almost completed at the Salford Docks, which will contain three 1,000 KW. rotary converters, and allow for three similar

machines being installed later. This will supply power and lighting to the No. 9 Dock, where a large grain elevator is nearing completion. A static sub-station has been equipped at Pump Street in the Ordsall district to supply local works,

FIG. 2.—E.H.T. SWITCH CUBICLES.

and it is proposed to build another rotary sub-station in the Greengate district for lighting and tramway supply. It has, moreover, been decided to add a second 5,000-KW. three-phase turbine set alongside the present one, to be in readiness for the winter of 1915-6, by which time the three-phase H.T. system of supply will be definitely established.

As various improvements and alterations have been made at the Frederick Road station from time to time, some reference to its general equipment may be of interest.

The boiler house contains 16 30 ft. × 9 ft. Lancashire boilers, equipped with superheaters and Hodgkinson machine stokers, also one Babcock boiler of twice the steaming capacity of the other units.

Coal is obtained from barges on the adjacent canal, and stored in overhead bunkers from which the stoker hoppers are fed through spouts in the usual way.

The coaling equipment includes an electrical jib crane for transferring the coal from barge to the hopper of a Babcock tray conveyor, which rises from the canal bank passing along the top of the bunker structure.

At either end of the boiler house are economisers and a brick chimney, also a pump room with electrical and steam-driven feed pumps, to which a turbine-driven pump is being added.

The original engine plant is of the jet condensing type, the water for which was obtained from the canal at one time. The increasing water requirements of the station, however, led to the adoption of cooling tower plant and the sinking of a deep well for the supply of make-up water for all purposes.

At present four Balcke towers are in use, and an adjoining pump house contains four 60-H.P. Mather & Platt motor-driven centrifugal pumps for forcing the water over the towers.

All the four turbine sets have been fitted with surface condensing plant, the condensate from which is used for boiler feed purposes, supplemented when required from the jet condenser hot well, the water of which is treated to remove any oil.

In the engine room, in addition to the 5,000-KW. turbine set mentioned, there are three 1,000-KW. Willans turbines coupled to one Brown-Boveri and two Siemens direct-current generators.

Six of the original 800-KW. Browett, Lindley-Mather and Platt direct-current sets remain, but one has been converted to the "Unaflow" type.

As our readers are aware, an unfortunate fire caused great damage to the switchgear at Frederick Road a year or two back; this has led to a complete reconstruction of this part of the plant, which now includes only modern boards, installed in the switch-room at one end of the building.

The upper floor of the switch-room contains a Ferranti single-phase switchboard and a Bertram Thomas direct-current traction board, while on the ground floor are installed a Bertram Thomas direct-current lighting and power board, battery switchgear and a Westinghouse control board for the three phase switchgear.

A single-phase supply is given to certain outlying districts and in the Prestwich area, being taken from the three-phase plant through two "Scott" connected Ferrant transformers, giving a two-phase (twin single-phase) 50-cycle supply at 3,000 volts.

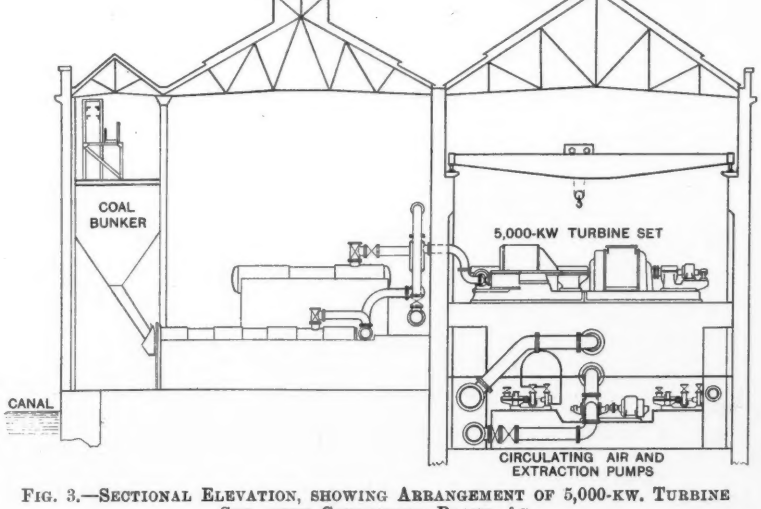


FIG. 3.—SECTIONAL ELEVATION, SHOWING ARRANGEMENT OF 5,000-KW. TURBINE SET, WITH CONDENSING PLANT, &C.

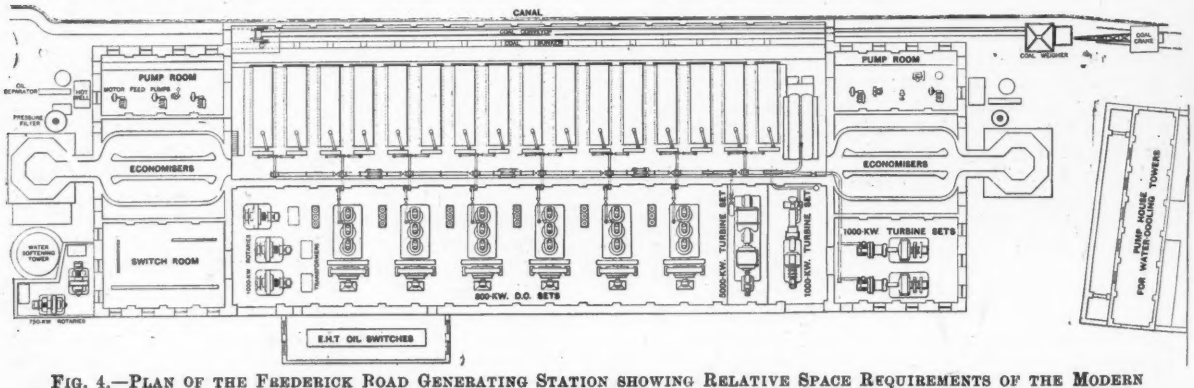


FIG. 4.—PLAN OF THE FREDERICK ROAD GENERATING STATION SHOWING RELATIVE SPACE REQUIREMENTS OF THE MODERN THREE-PHASE AND OLDER DIRECT-CURRENT TURBINE AND RECIPROCATING PLANT.

Each transformer consists of two units, and a spare unit is provided.

The switchboard is built up of standard Ferranti non-interlocked H.T. single-phase ironclad panels, including six transformer, two booster and eight feeder panels, some of them being spare. The automatic boosters and their switches were supplied by Messrs. Switchgear & Cowans, Ltd.

The Bertram Thomas traction board carries six 3,000-ampere generator and 20 feeder circuits equipped with reverse and overload circuit breakers respectively, of the loose handle type.

The feeder panels are entirely positive, a negative bus-bar for the feeders and generators being placed in the basement. The upper portions of the generator panels are positive, and separate lower portions carry the equaliser switches.

Bare copper strip connections from the top of the board pass down the wall to join lead-covered feeders at floor level.

The direct-current lighting and power board by the same firm on the floor below was designed with a view to accommodating a large number of feeders in a limited length. This provides for 12 3,000-ampere generator circuits and 68 (34 positive and 34 negative) 1,000-ampere feeder circuits, the former being at 12-in. and the latter at 9-in. centres.

The positive and negative sections of the board are separately grouped; the bus-bars are mounted on the front of the panels, and the switches make direct-contact on them.

The circuit breakers, of the reverse current type on each generator pole and of the overload type on each feeder, are all mounted on the back of the board and operated from the front.

The connections leaving the board are all in bare copper, and at top or bottom only, and in the case of both direct-current boards non-inflammable insulation has been provided for all small wiring and for the iron frameworks of the panels, in order to minimise the risk of accidental contact and fire. All the instruments were supplied by Messrs. Elliott Bros. We reproduce in figs. 7 and 8 views of the upper and lower switch-rooms, showing the single-phase and direct-current boards installed there.

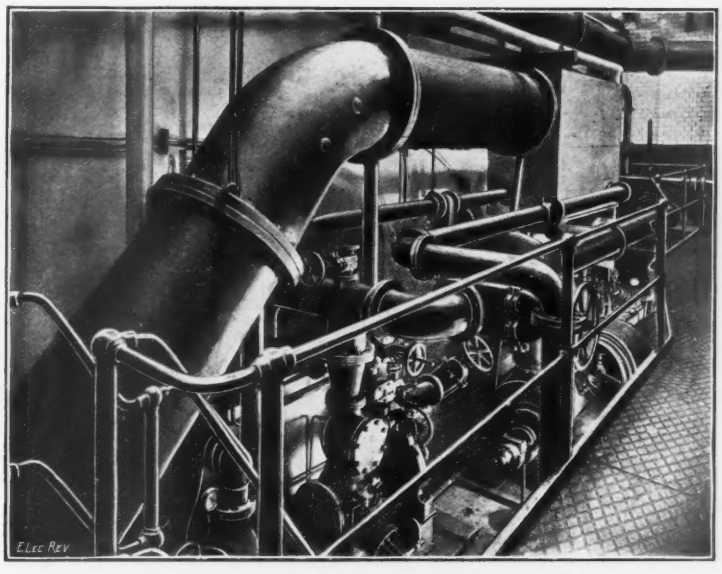


Fig. 5.—View of the Rotary Air and Circulating Pumps, 5,000-kw. Westinghouse Turbine.

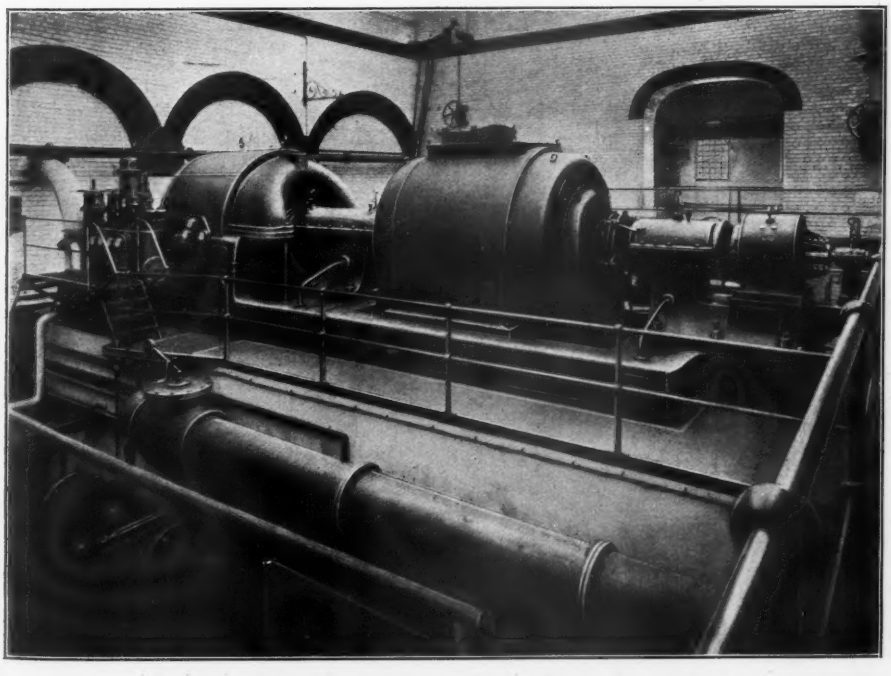


Fig. 6.—5,000-kw. Westinghouse Three-Phase Turbine Set.

In conclusion, we are indebted to Mr. J. A. Robertson, the borough electrical engineer, and to his deputy, Mr. Dickson, for giving us every assistance in the compilation of this description.

REINFORCED CONCRETE.

We are given to understand that the Local Government Board is setting its face against reinforced concrete to a very great extent, and refuses to sanction loans for this material for such periods as it would for other materials of construction, such short terms as ten years being what the Board will only allow in cases where, ordinarily, 25 years would be the period. Many a concrete building is ugly and unsightly and has the appearance of something which has failed to find a suitable body shape in which to live. Arched bridges are structures for which concrete appears to be a very suitable material, and in which it acts under the best conditions; it is under such conditions that any material shows to the greatest advantage, and such structures, carrying in their form the elements of stability, must inevitably present an artistic appearance, like the windmill tower, whose form and figure are fitted to the work to be done, and which is, therefore, necessarily artistic.

It is fortunate that the dictum of the Local Government Board on matters of engineering does not carry very much weight, though it may have serious effects because of the

results which arise out of the Board's bad judgment; but a protest ought to be made against the Board's ruling. Properly constructed, reinforced concrete is a safe and sound material, and the metal rods which it encases are very effectively protected from all external influences. All the weight of evidence is, we believe, in favour of the safety of the material, and probably the Concrete Institute will see to it that the evil influences of the Local Government Board are curbed.

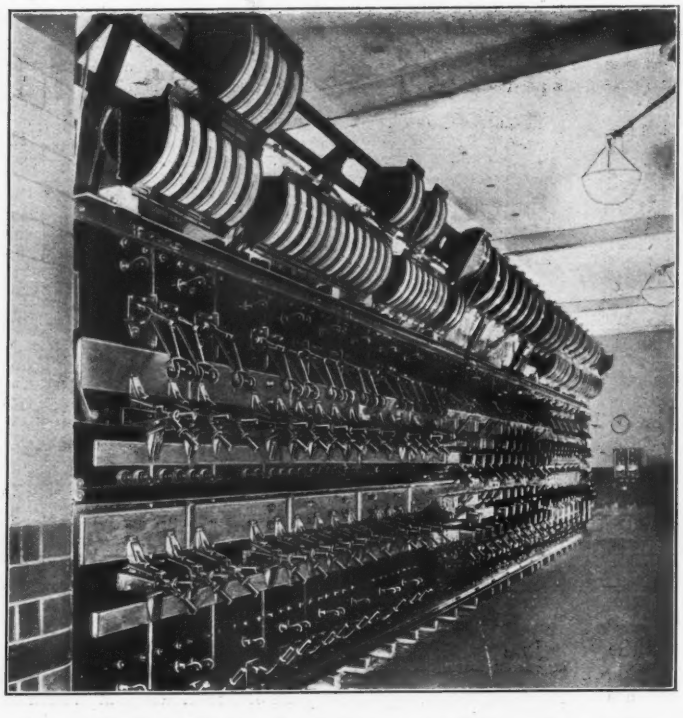


FIG. 7.—BERTRAM THOMAS D.C. LIGHTING AND POWER BOARD, SALFORD ELECTRICITY WORKS (see page 81).

But a word of warning may be given as to the unnecessary use of the new material. There is a tendency for it to be employed where bricks and mortar would be cheaper. Quite recently a case came under notice where two quite independent tenders were sent in for reinforced work. They differed considerably in amount for the same work, but the same firms quoted alternative prices for brickwork; the two offers were remarkably close and were a long way below the lowest offer for the reinforced concrete. Like so many new things which at the outset are supposed to be extraordinarily simple and cheap, ferro-concrete is by no means simple and is not always cheap. Where a structure can be so designed then concrete may be brought in usefully, but, though there is no great time required to tip the stuff into its moulds, a very great amount of time may be occupied in preparing the moulds and placing the many bars and hooks in position. The secret of good reinforced construction is to arrange the metal cores so that they occupy the direction of the lines of stress and failure which would develop in a homogeneous solid of like form under like stress application. Probably the true field for reinforced concrete work is in large and heavy work and in repetition work rather than in small work, for which the moulds involve a cost out of proportion to the small weight they contain.

There is a good deal of what may be termed the charlatanism of the tradesman in some reinforced concrete practice. Special bars are urged as the only really safe bars; the bars must be twisted, so as better to grip the concrete, but if twisted to the right instead of to the left, they will not hold the cement at all, and so on. Needless to say, most of these pretensions are mere twaddle. Any man who is an expert in steel girder work stresses should know how to dispose his tension material in concrete. The fact that metal bars are to be embedded in the concrete should not serve as an excuse for the slightest carelessness in the mixture. It is more than ever important that the aggregate should be good and clean; that the sand should be the same and in quantity more than enough to fill the voids, and that the cement should be well burned and slow setting, and in quantity more than ample to fill the sand voids. Cement ought not to be given its slow setting quality by the admixture of gypsum—that German method of adulteration for which there is no excuse, tending, as it does, to unsound cement.

The aggregate should be reasonably moist to begin with, enough cement to colour it all cement colour being put in before adding the sand and cement, which should be thoroughly mixed by machine before adding the aggregate and water. The time-honoured mixing by turning twice dry and thrice wet, or even doubling this amount of turning, is not to be considered as mixing, for it does not eliminate the brown streaks of the sand. Important work should be machine-mixed dry, and then the mixing continued wet.

Once Bit, Twice Shy.—At the meeting of the Illinois Electric Railways Association at Chicago, November 21st, Mr. W. F. Carr, Ottawa, Ill., advised against the policy of discharging men who had made mistakes which caused accidents, for, he declared, a serious accident for which a man is to blame leaves an indelible impression upon his mind and makes him a more careful and thoughtful operative in the future. If, on the other hand, this same man were to be discharged, his place must be given to a new man, and it is very possible that the whole lesson of safety and carefulness will then have to be learned all over again.—*Electrical World.*

FIG. 8.—THE UPPER SWITCHROOM, SALFORD, SHOWING SINGLE-PHASE AND D.C. TRACTION BOARDS (see page 81).

LIGHTING and POWER NOTES.

(*Continued from page* 78.)

Sheffield.—AN OPPOSED INQUIRY.—The electrical contractors in the town are instructing counsel to represent them at the L.G.B. inquiry to-morrow (Saturday), in opposing the application of the City Council for a loan for the erection of the electricity department's new premises in Bow Street, it being contended that the existing accommodation is sufficient if the department limits its operations to what the traders consider legitimate business.

South Africa. — The Victoria Falls and Transvaal Power Co. reports that the amount of power now being delivered shows an increase over that for June last. In connection with the erection of new plant at Brakpan, the first extension set will be in commission within a month, and the second set will be available for service two months later. Fresh demands for power requirements are being received.

Stockport.—L.G.B. INQUIRY.—An inquiry has been held respecting an application of the T.C. for permission to borrow £17,000 for the electricity undertaking—£12,500 for turbo-generating plant, and £4,500 for two water-tube boilers. The inquiry was closed.

Torpoint.—STREET LIGHTING.—The U.D.C. has definitely decided to substitute electricity for gas for public lighting, and has accepted the tender of the Electricity Supply Co. for a term of three years at £2 2s. per lamp per annum. The alternative was 3d. per unit. The Gas Co. tendered at £1 19s. 6d. per 100 C.P. lamp, or 3s. 9d. per 1,000 cb. ft., and it was stated that with mantles, &c., the cost per lamp would work out at £2 16s. 2d.

Torquay.—PROPOSED LOAN.—The T.C. is to make application to the L.G.B. for sanction to a loan of £13,808 for new plant and machinery at the electricity works.

Tunbridge Wells.—HALF-WATT LIGHTING.—The Lighting Committee proposes to substitute two 300 C.P. half-watt lamps for each of the nine arc lamps in three streets.

Walsall.—The Council recently adopted the bold policy of replacing the old generating station and plant by a modern station on a new site; the erection of this is now progressing, and together with the proposed alterations of system of distribution is expected to result in a great reduction in costs. Under the advice of the recently-appointed manager (Mr. H. A. Howie), the scale of charges for lighting, heating and cooking has been revised and alternative tariffs provided, including a rateable value scheme of charging for domestic supply. A sales department has also been instituted, and a showroom opened in the centre of the town.

Warrington.—EXTENDED SUPPLY AREA.—The R.D.C. has decided to grant the necessary declaration of support to the T.C.'s application for powers to supply electricity to the districts of Great Sankey and Penketh. The Stockton Heath Parish Council has also decided to assent to the proposed order in so far as relates to the district, provided that the energy shall be supplied on not less favourable terms than those on which it is supplied to consumers in Warrington.

Whitefield.—SEWAGE PLANT.—Application is to be made to the L.G.B. for sanction to the installation of an electric plant at the sewage works instead of the gas plant previously approved of, and to the borrowing of a further loan of £123 to cover the increased cost.

Windsor.—ELECTRIC PUMPING.—An electric motor pump is to be installed at the waterworks for use while the turbines are out of action. This will last until the river drops to its normal height.

Wokingham.—The R.D.C. has decided not to oppose the application of the Reading Electric Supply Co. for a prov. order to supply current to parishes within the Council's area.

Wolverhampton.—SEWAGE WORKS SUPPLY.—The Electricity Committee has decided to give a supply of current to the sewage works for power and lighting purposes.

Worcester.—SEWAGE PUMPING.—The City Council has had the question of sewage pumping under discussion, after considering reports by the city electrical engineer and city engineer bearing on the relative costs of electricity and suction gas. In the opinion of the Committee, the annual cost of pumping by suction gas and electricity was £2,000 and by all-electric drive £2,330, and it was decided to recommend the Council to adopt the latter, but to retain the suction gas plant for pumping storm water. As the result of long discussion, however, an amendment was adopted to retain the suction gas and electric plants at the works and obtain careful costs of their working, when a further report will be presented.

The T.C. is to apply to the L.G.B. for a loan of £800 for electric services during the next three years.

York.—L.G.B. INQUIRY.—The Corporation, having applied to the L.G.B. for sanction to borrow £19,000 odd for the purposes of the electricity undertaking, the usual inquiry has been held. During the hearing, the inspector (Mr. Hooper) criticised the financial policy of the undertaking when he was informed that the reserve fund practically only amounted to £55.

TRAMWAY and RAILWAY NOTES.

Accrington. — PARCELS SERVICE. — The tramway department, in conjunction with Messrs. Lober's motor-'bus service, is now carrying parcels between Accrington and Burnley.

Bournemouth.—The B. of T. has sanctioned the borrowing by the Corporation of £3,903 for the reconstruction of a portion of the tramway track in Holdenhurst Road.

Bradford.—The Tramways Committee has considered a report by the general manager in regard to a mishap to a car on Church Bank; the Committee highly commended the conductor, awarding him £5 for meritorious conduct.

SIX MONTHS' WORKING.—The report of the working of the city tramways for the six months ended September 30th, 1914, shows that the income was £161,818, an increase of £8,559; the profits increased from £20,797 to £23,730; and the mileage run indicated an advance of 141,000 miles. On the other side of the account the maintenance of cars showed an increase of £3,300; wages of drivers and conductors £2,815 more than the corresponding six months of 1913; and there was also an increase of £1,695 for electric power. There was a saving of £3,400 on repairs to the permanent way, and a decrease of £985 in the amount of the rates on the undertaking. As a whole, the tramways had suffered a loss of £337 during the half-year, but there is compensation in the fact that the whole expenditure—including interest and sinking fund charges—has only been 8d. per mile, one penny less than the corresponding period of 1913.

Cardiff.—The Tramways Committee recommends the doubling of the tramway track from the corner of City Road to Milton Street, at a cost of £7,000.

Continental Notes.—ITALY.—The electrification of the Italian State Railways is progressing steadily, if slowly. It is controlled mainly by the available funds in the hands of the Railway Administrator in each financial year. The progress of the works is shown by the yearly expenditure since 1907. In the the three years from 1907 to 1910 the expenditure was 3,084,000 lire. In the working year 1910-11, 3,786,000 lire; 1911-12, 4,800,000 lire; and in 1912-13, about 7,000,000 lire. There was also allotted in 1912-13 for electric traction permanent plants about 13,000,000 lire, besides a sum of about one million lire for other works. This contrasts with 4,225,000 lire allotted in 1911-12. On June 30th, 1913, the extent of the transmission lines amounted to nearly 800 km. The sub-stations numbered 30, four of which belonged to the old Varesine section. The total power amounted to 50,000 KW. Electric traction has worked regularly on the Turin-Modane line, on the old lines of the Giovi, on the Milan-Varese section, and on the Valtellina lines, and a regular electric service of passenger and goods trains has been started on the Savona-S. Giuseppe-Ceva section. There now remains the electrification of the branches of the Giovi, the Lecco-Monza and the Turin-Pinerolo lines.—*Revista tecnica d'Elettricita.*

A public meeting was recently held at Cantello, near Milan, with the object of forming a society for the construction of an electric tramway to run from Varese to Folla di Malnate, Cantello and Ligurno, and eventually to the Swiss frontier. The scheme has arisen out of a desire to provide employment for men out of work.

The Italian State Railways power station at Rivarolo was recently completely destroyed by fire, the cause being unknown.

FRANCE.—A Reuter's Paris message mentioned a tramway collision last week on the Vincennes-St. Augustine route, by which one person was killed and 40 injured—13 seriously and three mortally.

Edinburgh. — TRAMWAY PURCHASE. — The Tramway Committee has agreed to seek expert advice before finally deciding to ratify the agreement between the Committee and the Tramway Co. relating to the acquisition by the Corporation of the company's rolling stock at the time of the expiry of the lease.

Halifax. — TRAMWAY EXTENSION BILL. — The promotion in Parliament of a Bill for tramway purposes and works, involving an expenditure of £120,000, has been agreed to at a special meeting of the T.C.

Hollingworth.—A Sub-Committee has been deputed to confer with the Mottram and Saddleworth D.C.'s on the question of the Stalybridge Joint Board's Tramways and Electricity Bill.

Hull.—TRAMWAY EXTENSION.—The T.C. has decided to apply for a prov. order for the construction of additional tramways in the city.

London.—TUBE EXTENSIONS.—The Hammersmith B.C. is to discuss the District Railway Bill to be promoted in the next session of Parliament. This seeks power to construct an additional single line, to relieve west-bound traffic, under the Broadway, and to make other arrangements to permit of the Piccadilly Tube trains using the existing District Railway tunnel.

Maltby.—The P.C. has unanimously agreed to support the Rotherham Corporation's proposal to substitute tramways for the present railless trolley vehicle system between Rotherham and Maltby.

Morley.—PROPOSED LOAN.—The Leeds T.C. has applied for a loan of £31,500 for the erection of a tramway depôt, sub-station, &c., at Morley.

Nottingham.—NEW ROUTE OPENED.—The extension of the Corporation electric tramways from Sherwood to the neighbouring urban district of Arnold was opened on January 1st. A 10-minute service is provided on the new route.

Newcastle-upon-Tyne.—Owing to the number of complaints as to the inefficiency of the local tramway service, the chairman of the Corporation Committee made a statement, pointing out that 295 men had joined the Army, of whom 230 were either motormen or conductors, men whose places it was difficult to fill. Some 150 other men had been absorbed in local works, mainly in the armament and warship building works in the neighbourhood. Some of this loss they had been unable to replace, and now they had only 653 on the books as against 723 at the outbreak of war. Another factor which tended to handicap them was an increase in the traffic. The system had had to cope with nearly 200,000 more persons than over the Christmas of a year ago, the mileage was increased by 6,000 miles, and there were only two more cars running than a year ago. A similar state of things was found in the New Year week. Much of the delay in sections of the service is attributed to the movements of troops in the city and neighbourhood.

Sheffield.—The Tramways Committee has adopted a report of a Sub-Committee recommending the conversion of 12 single-deck cars into double-deckers.

St. Helens.—An application has been received from the Lancashire Light Railways Co. for terms upon which the Corporation will supply energy to the light railway between Prescot and Knotty Ash.

Wallasey.—It is proposed to double the tramway track in Seabank Road and Seaview Road.

Yeadon.—GAS LEAKAGE.—At the last meeting of the Council a complaint was made by the Leeds electrical engineer in regard to an escape of gas in Kirk Lane. It appeared that gas got into the tramway boxes, which contained fully 50 per cent. of gas, and this not only constituted a danger, but also hindered the completion of the tramway extensions. The attention of the Gas Co. had been drawn to the matter on two or three occasions, but nothing had been done. The Council decided that the Gas Co. should be asked to attend to the matter.

TELEGRAPH and TELEPHONE NOTES.

Australia.—A reduction has been made by the Federal Executive in the charge for wireless messages to and from vessels licensed in Australia and New Zealand, from 11d. to 6d. a word.—*Aust. M. S.*

A wireless station has been erected at Rabaul, and is working satisfactorily, communications being transmitted through Port Moresby and Thursday Island to Australia. The installation, which comprises Telefunken and Marconi instruments, was mostly the property of the German Government, being used at a high-power station at Bitapaka, which was captured after a sharp encounter. The whole of the installation and the operating has been done by members of the Expeditionary Force, and is under the charge of the senior operator, Corporal G. H. Smythe, Signaller, assisted by four Marconi operators. Power is supplied by a captured German dynamo and converter driven by a Bolinger oil engine, under Electrician Corporal Tenbosch, assisted by two mechanics.—*Sydney Morning Herald.*

Canada.—On January 1st an amalgamation of the Great North-Western and Canadian Northern Telegraph Companies took place, and the two systems will in future be operated as one under the style of the Great North-Western Telegraph Co.

It is understood that within the next few months the lines and offices of the Western Union Telegraph Co. in the Maritime Provinces will be operated by the Great North-Western Co., which will then have the largest telegraph system in Canada, covering the country from the Atlantic to the Pacific.

It had been stated in Canada that the Grand Trunk Pacific Railway's telegraph system was also to be included in the merger, but this is denied by the Grand Trunk Pacific Co., which announces that its system is entirely distinct from the new combination, and is fully equipped for carrying on commercial telegraph business from the head of the lakes to the Pacific Coast.—*Standard.*

China.—Tsingtao, which was recently captured from Germany by the Japanese, was connected with Yap Island in the South Seas by a submarine cable *viâ* Shanghai, the station being located in the German Post Office in Shanghai, which is a neutral city; the shore ends of the cable at Shanghai are also in neutral territory. The line was taken over by the Japanese on the fall of the fortress, and it is announced that it will have to be cut on the high seas in order that it may be connected with the Japanese Post Office in Shanghai.

Fire Alarms at Luton.—The Fire Brigade Sub-Committee has reported in favour of the installation of the "Knight" fire-alarm system in the town, at a cost of £450. The matter is under consideration.

Field Telegraphs in East Africa.—The unexpected difficulties which may be met with in novel circumstances are well illustrated by the following extract from a letter published in the *Times*:—"The funny side of war is very much before us out here. The telegraph section, for instance, with great speed and efficiency fixed up the field telegraph, 48 miles of it, on bamboo poles. Next day, walking along the line, I never saw such a mess. Wherever a giraffe had come across it in the night he seemed to have wound it round his neck and then started off at top speed."

Illicit Wireless Apparatus.—Henry Summers, smack owner, charged at Ramsgate with having in his possession, without the permission of the Postmaster-General, certain apparatus intended to be used for sending or receiving wireless messages, which he said he bought from the Trinity Brethren in 1913 for 9 guineas, and had tried to sell, was fined £10, including costs.

On January 11th a district court-martial was held at Manchester on Frederick Goddard, of Ardwick, charged with having at his home certain wireless apparatus. Evidence was given to the effect that his wireless installation was dismantled at the beginning of the war. He had a licence to use a wireless telegraph for experimental purposes. The proceedings were adjourned to Tuesday, when the accused was acquitted.

Russia.—An agreement has been made between the Russian and Mongolian Governments which grants the Russian Central Administration of Posts and Telegraphs a concession for the construction of a telegraph line from Monda, in the Government of Irkutsk, to the Mongolian town of Uliasutai.—*Board of Trade Journal.*

San Marino.—This little Republic on the Adriatic is accused by Germany of allowing its wireless station to be used for transmitting news from French warships to Paris. The Government of San Marino has refused to allow a German Commission to visit the plant, but would consent to an Italian Commission.

The Telephone Service.—No fewer than 450 telephone exchanges have been opened in small villages during the last three years. The average number of subscribers on these rural exchanges is 10. In addition, 1,200 call offices have been opened at places too small to support an exchange.—*Standard.*

Wireless in Warfare.—The *Wireless World* for January states that in 1913, during the Upper Rhine reliability trials, the old Zeppelin "Viktoria Luise," which took part in the trials, remained throughout their duration in constant wireless communication with the base at Frankfort over distances up to 120 miles, and with other stations up to 200 miles, so that a regular wireless service for her passengers was maintained. The wireless equipment of the newer naval and military craft is far more powerful. The aerial consists of a 3-mm. phosphor-bronze wire, unwound to the required length (the full length being 750 ft.) from a spool, and floating freely in the air when the airship is aloft. The apparatus itself is extremely compact, and derives the necessary power from a small dynamo driven off the engines. It weighs, complete, 150 lb., or, including the dynamo, 270 lb.; has a minimum range of 120 miles, and can encompass wave-lengths varying between 300 and 1,200 metres. It is claimed that the danger from sparks during the process of transmission has been wholly eliminated. Every large aerodrome in Germany, both military and civilian, has its wireless station, some of which, such as those at Johannisthal, Cologne, Friedrichshafen, Frankfort, and Mannheim, are very powerful. In addition, the construction was begun some time ago of a series of wireless stations forming a ring right round the German frontiers. Their purpose is twofold: first, to enable German airships to remain in constant wireless touch with a German base during their expeditions; and, secondly, to provide them with what may be described as a wireless compass, enabling them to fix their position when out of sight of land with quite a fair degree of accuracy as a result of signals from these wireless stations.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—ADELAIDE.—February 10th. Testing instruments, for Postmaster-General. See "Official Notices" January 1st.

BRISBANE.—March 10th. Motor-generator, power board, &c., for Postmaster-General. See "Official Notices" to-day.

BRISBANE.—(Extension of time to March 16th.) Common battery multiple switchboard and automatic or semi-automatic switchboard, &c., for the Deputy P.M.G.—*Board of Trade Journal.*

PERTH.—February 10th. Telephone switchboards and parts, for Postmaster-General. See "Official Notices" January 8th.

Melbourne, Brunswick and Coburg Tramways Trust.—February 24th. Special work, bonds, steel and wood poles, overhead materials, H.T. cable, trucks, and sub-station electrical equipment. March 10th. Car equipments (motors, &c.), car bodies, wheel

guards. Specifications for each item, £2 2s. (returnable), from the office of the Engineer (Mr. Struan Robertson), Sydney Road, Coburg. Copies can be seen at the Board of Trade Commercial Intelligence Department in London.

Beckenham.—January 25th. U.D.C. One 120-KW. D.C. generator and switchgear to couple to 120-KW. steam alternator. See "Official Notices" January 8th.

Bolton.—February 11th. Corporation. Low-tension sub-station switchgear, for the Electricity Department. See "Official Notices" January 8th.

Bury.—January 30th. Extension to reinforced concrete retaining wall at the electricity generating station, Chamber Hall. Specifications, &c., from Mr. J. A. Settle, Borough Engineer.

Cheltenham.—January 30th. Corporation. Twelve months' supply of electric light fittings, &c. Forms of tender from Mr. J. S. Pickering, Borough Engineer.

Croydon.—January 25th. General stores, for the Corporation Tramways Department, for a year. The Manager, Thornton Heath.

Darlington.—February 2nd. Corporation. Alternative tenders for 2,000-KW. and 3,000-KW. turbo-alternators; separate tenders for condensing plant. See "Official Notices" to-day.

Ipswich.—January 22nd. Corporation Electric Supply Department. Coal-handling plant. Specification, &c., 21s. (returnable). Mr. F. Ayton, Engineer and Manager.

Larne.—January 29th. For lighting public streets and roads by electricity for three years from August 1st, by the U.D.C. Particulars from Mr. W. G. Younge, Clerk to the Council.

Leeds.—January 22nd. Overhead electrically-driven travelling crane, and coal and ash-conveying plant, for Electric Lighting Department. See "Official Notices" December 11th.

London.—L.C.C.—January 26th. Platelaying, &c., for electric tramway, Grove Road and Burdett Road, &c. Specifications, &c., from Mr. G. W. Humphreys, County Hall, Spring Gardens, S.W.

January 25th. Lighting installation (200 wiring points, 260 lighting points) at Exmouth Street Elementary School, Hampstead Road, N.W. See "Official Notices" to-day.

BATTERSEA.—The B.C. is recommended to invite tenders for three, six, nine and twelve months' supply of oils, engine-room stores, electricity meters, service joint-boxes, electric lamps, &c.

Manchester.—January 19th. Tramways Committee. (*a*) Permanent way special track work, and (*b*) permanent way points, tongues, and hardened steel centres. Specifications, &c. (£1 1s. returnable), from Mr. J. M. McElroy, general manager.

New Zealand.—WELLINGTON.—February 28th. Public Works Department. 18 step-down transformers, for the Lake Coleridge power scheme. Specification at the Public Offices, Wellington.

Oldham.—January 18th. For electric lighting the Council School at Higginshaw, for the Oldham Education Committee. Specifications from Messrs. Winder & Taylor, architects, Union Street.

Plymouth.—January 21st. Corporation. Twelve months' supply of carbons, A.C. meters, transformers, cables, oils, waste, &c. See "Official Notices" January 8th.

Redditch.—U.D.C. Two turbo-alternators, each 1,000 KW., with condensers, cooling tower, &c.; two synchronous motor-alternators of 300 KW. and 150 KW. respectively. See "Official Notices" January 8th.

Rochdale.—January 27th. Tramways Committee. Erection and completion of repair shops: (*a*) reinforced concrete foundations and car platform, (*b*) steelwork (steel frame), and (*c*) builders' work. Particulars from Mr. P. W. Hathaway, Town Hall.

Spain.—February 7th. The municipal authorities of Berlange de Duero (province of Soria) are inviting tenders for the concession for the electric lighting of the town during a period of 10 years.

Tenders have just been invited by the municipal authorities of Sarria (province of Lugo) for the concession for the electric lighting of the town during a period of 10 years.

Tunbridge Wells.—January 26th. Cooling tower and pipework, two water-tube boilers, economisers, mechanical stokers, pipework, and feed heater, for Borough Electricity Works. See "Official Notices" January 1st.

Woodstock.—February 4th. Generating plant, switchboard, battery, wiring, lamps and fittings (120 points), for the Union Workhouse Guardians. See "Official Notices" to-day.

CLOSED.

Australia.—In connection with the parcels post office building adjoining the Sydney railway station, the Minister for Home Affairs has accepted the following tenders:—Four goods lifts, electrically driven, Messrs. Edmiston & O'Neill, £6,700; two service lifts, electrically driven, Messrs. Edmiston & O'Neill, £600. He has also accepted the tender of Messrs. Gibson, Battle & Co. for an electrically-driven inclined elevator, including foundations. The whole of the work is to be of Australian manufacture, with the exception of some small items, such as ropes, which are not made in Australia; they will be of British manufacture.—*Melbourne Age.*

MELBOURNE.—An Australian newspaper states that large orders for wire have just been placed by the Postmaster-General's Department, the department having accepted the offer of the British Insulated and Helsby Cables, Ltd., to supply 126 tons of wire, of varying weights, for £10,625. All the wire is to be of English manufacture.

The following contracts have been placed:—

P.M.G.'s Department, Victoria.—

80 cable terminals, 52 pairs, £466 13s. 4d.—Mr. F. B. Cook.

P.M.G.'s Department, Tasmania.—

300 telephones, common battery wall pattern, £476 5s.—British General Electric Co., Ltd.

100 telephones, common battery table pattern, £125 8s. 4d.; 75 ditto, with generator, £198 15s.; 50 ditto, table pattern, with generator, £107 10s.; 100 ditto, with switch, £418 15s.; 25 ditto, table pattern, with switch, £97 10s.—J. Bartram & Son Pty.

8 tons bronze wire, £261; 10,000 copper tapes, £9 8s. 4d.; 10,000 binders, £12 18s. 4d.—British Insulated & Helsby Cables, Ltd.

Sydney Municipal Council has received the following tenders for—

2,000-K.V.A. 33,000/5,000-VOLT TRANSFORMERS.

Siemens Bros.		£5,775
British Westinghouse Co.	(recommended)	**6,064**
Australian General Electric Co.		10,386

1,000-K.V.A. AND 500-K.V.A. TRANSFORMERS.

Noves Bros.		£2,782
British Westinghouse Co.	(recommended)	**2,869**
Siemens Bros.		2,293
Australian General Electric Co.		5,948

500-K.V.A. 5,000/415 TRANSFORMERS.

Australian General Electric Co.	(recommended)	**£1,644**
Siemens Bros.		1,852
Standard Waygood Hercules, Ltd.		1,960

MOTOR-DRIVEN AIR COMPRESSOR.

N. Guthridge, Ltd.	(recommended)	**£234**
Standard Waygood Hercules, Ltd.		235
Australian General Electric Co.		236

VACUUM CLEANERS.

N. Guthridge & Co., Ltd.		£126
H. P. Gregory & Co.	(recommended)	**150**
Lamson Store Service Co., Ltd.		155
J. Hardie & Co.		160
Noves Bros.		170
E. V. Morrison & Co.		188
G. Vincent		463
Elliott, Maclean & Co.		497
" "	(alternative)	517

33,000-VOLT CABLE.

Callenders		£16,100
Western Electric Co.	(recommended)	**17,591**
Henley Telegraph Works, Ltd.		17,686
Australian General Electric Co.	(alternative)	18,090
Siemens Bros. & Co.		19,485
British Insulated & Helsby Cables, Ltd.		20,125
" "	"	20,484
Australian General Electric Co.		20,689
Warburton, Franki, Ltd.		21,375
Lawrence, Hanson Electric Co., Ltd.		25,875

Melbourne City Council.—

Hoists, electric, motors, at city abattoirs, £1,552.—Edmiston & O'Neill.

—*Tenders.*

Bacup.—The T.C. has decided to order two transformers from Messrs. Ferranti, Ltd., and 7/18 S.W.G. cable from the Macintosh Cable Co., Ltd. The tender of the Post Office has been accepted for connecting the out-stations and the central police station by telephones.

Bradford.—The Tramways Committee has accepted the tender of Messrs. Wm. Hird, Sons & Co., Ltd., of Wyke, Bradford, for the supply of 4,000 yards of grey serge, at the price of 6s. per yard, for the purposes of uniform clothing, for the Tramways Department. It has also resolved to accept the offer of the Bradford Technical College to supply five pieces of similar cloth at the same price.

The Technical Education Sub-Committee of the Corporation has accepted the following tenders for motors and wiring to motors in the workshop:—

Phœnix Dynamo Manufacturing Co., Ltd.—Five motors, £360.
Smith & Croft.—Wiring the above motors, £68.

Bristol.—The Docks Committee of the T.C. has accepted the tender of Messrs. Siemens Bros. for arc lamp carbons.

Canterbury.—The T.C. has accepted the tender of Mr. S. Terry for electrical engineers' work for the ensuing half-year.

Clacton.—The tender of Messrs. Johnson & Phillips, Ltd., has been accepted by the U.D.C., at £425, for supplying and laying various lengths of cable.

Dartford.—The E.L. Committee has placed orders with Messrs. John Hudson & Co., Ltd., and Messrs. E. J. and W. Goldsmith, Ltd., to supply 300 tons of bituminous coal, at 2s. per ton above contract price to cover war risks, and for 110 tons of Derbyshire peas, at 18s. 6d. per ton, and 600 tons of New Hucknall slack, at 16s. 9d. per ton, respectively.

Gillingham (Kent).—The T.C. has accepted the offer of Messrs. Wm. Cory & Son, Ltd., for up to 150 tons of coal for the electricity works, at 2s. per ton over contract price.

London.—The Metropolitan Asylums Board has accepted the tender of Messrs. Turnham & Co., at £257, for installing electric light, internal telephone and bell system, provision of electric bells, and separating the fire alarm system at Sheffield House, Sheffield Street, W.C.

BATTERSEA.—The Electricity Committee has accepted the tender of the Empire Stone Co., at £545, for the construction of a reinforced concrete coal-bunker at the generating station. The Committee recommends that the offer of Messrs. Foster & Co. for 6,000 tons of Pooley Hall small coal be accepted.

HAMMERSMITH.—The B.C. Electricity Committee has accepted the offer of Messrs. W. Cory & Son, Ltd., for 1,000 tons of Midlands small coal, at 8s. 6d. per ton; and that of Messrs. Cory Bros. & Co., Ltd., for 1,000 tons of Gedling small coal, at 12s. 6d. per ton.

Morley.—The Leeds Corporation Tramway Committee has accepted the tender of Mr. Paul Rhodes, of Leeds, for the erection of a tramway depôt at Morley.

Nuneaton.—The T.C. has accepted the tender of Messrs. Brown-Boveri & Co., at £65, for the supply of an automatic pressure regulator for the Electricity Works.

Salford.—The Tramways Committee recommends the acceptance of the tender of Messrs. Edward Wood & Co., Ltd., for the steel work required for the extension of the central car depôt, Pendleton, at £1,295.

Sheffield.—The Electricity Supply Committee has resolved to accept the following tenders:—

Staveley Coal & Iron Co., Ltd.—Cast-iron feed water pipes, £65.
Foster Bros.—Mild-steel steam pipes and valve, £133.
Lea Recorder Co., Ltd.—Combined recording water meter, including steel notch tank and float chamber £108
T. Smith & Sons.—Steam crane and grab, £1,018.

The City Council is recommended to accept the tender of the General Electric Co. for the supply of two 30-H.P. electric motors to the Water Department.

Ship Lighting.—The tender of Messrs. Siemens Bros. Dynamo Works, Ltd., has been accepted for the supply of Wotan, tantalum, and carbon filament lamps to Messrs. G. Thompson and Co., the Aberdeen White Star Line.

Stockport.—The Health Committee has accepted the tender of Messrs. W. A. Shaw & Co. for certain alterations to the electric lighting at the hospital.

The tender of Messrs. Kelsall Bros., for Pleasley best nutty slack top hard, Mansfield, at 10s. 5d. per ton delivered, from 70 to 90 tons per week for 12 months, has been accepted by the Electricity Committee. The Committee has also offered to take a limited weekly supply of Brownless slack, Biddulph Valley, at 9s. 3d. per ton delivered, for a period of 12 months.

The T.C. has accepted the tender of Messrs. Dick, Kerr & Co., Ltd., for a 5,000-KW. turbo-alternator.

Stretford.—The Electricity Committee has accepted the tender of Messrs. W. T. Henley's Telegraph Works Co. for 150 yards of 8-in. single cable, for £84.

Torquay.—The Electricity Committee has agreed to a request from Messrs. Whiteway & Ball that they should be paid an extra 2s. per ton on the original price for any future supplies of coal, owing to the difficulties and delays in navigation.

Weymouth.—The Electricity Committee has accepted the tender of Messrs. Browett, Lindley & Co., Ltd., for a 200-KW. gas-driven plant, at £3,000, and that of Messrs. Whipp & Bourne for the necessary switchboard, at £87. The tender of Mr. G. F. Bowering, at £398, for foundations for machinery at the electricity works has been accepted.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, January 15th. At 8 p.m. At 39, Victoria Street. Paper on "Motor-Car Accessories," by Mr. R. S. Fox.

Friday, January 22nd. At 8 p.m. At 39, Victoria Street. Paper on "Rotary Air Pumps," by Mr. A. Arnold.

North-Western Section.—Monday, January 18th. At 7.45 p.m. At Jafa Café, 26, Corporation Street, Manchester. Paper on "Country House Electric Lighting Installation," by Mr. C. F. Clifton.

Institution of Electrical Engineers (Newcastle Local Section).—Monday, January 18th. At 7.30 p.m. At the Mining Institute. Paper on "Automatic Protective Switchgear for Alternating-Current Systems," by Mr. E. B. Wedmore.

Royal Society of Arts.—Monday, January 18th. At 8 p.m. At John Street, Adelphi, W.C. Cantor Lecture on "Oils, their Production and Manufacture," by Dr. F. Mollwo Perkin.

Illuminating Engineering Society.—Tuesday, January 19th. At 8 p.m. At Royal Society of Arts, John Street, Adelphi. Discussion on "Some Points in connection with the Scientific Development and Practical Application of Searchlights."

Nottingham Society of Engineers.—Wednesday, January 20th. At 7.30 p.m. At Welbeck Hotel, Milton Street. Ten-minute papers by members.

Institute of Marine Engineers.—Wednesday, January 20th. At 7.30 p.m. At Tower Hill, Minories, E.C. Extraordinary General meeting. At 8 p.m. Inaugural address by Sir A. Denny, Bart., LL.D.

Greenock Electrical Society.—Thursday, January 21st. At 7.45 p.m. At 21, West Stewart Street. Paper on "Electricity in a Shipbuilding Yard," by Mr. D. Angus.

Institution of Mechanical Engineers—Friday, January 22nd. At 8 p.m. At Storey's Gate, S.W. Paper on "Standardisation of Pipe Flanges and Flanged Fittings," by Mr. J. Dewrance.

Physical Society of London.—Friday, January 22nd. At 5 p.m. At Imperial College of Science, South Kensington. Paper on "Practical Harmonic Analysis," by Dr. A. Russell.

Royal Institution of Great Britain.—Saturday, January 23rd. At 3 p.m. At Albemarle Street, W. Lecture on "Aerial Navigation—Scientific Principles," by Dr. R. T. Glazebrook, F.R.S.

Association of Mining Electrical Engineers (West of Scotland Branch).—Saturday, January 23rd. At 4.30 p.m. At Royal Technical College, Glasgow. Joint Meeting with National Association of Colliery Managers. Paper on "Electricity at the Coal Face," by Mr. J. Bowman. After the meeting several Visual Signal Indicators will be exhibited.

NOTES.

Parliamentary.—SOUTH SHIELDS CORPORATION BILL.—A town's meeting of South Shields ratepayers has defeated the Corporation Bill, under which tramways estimated to cost £16,711 were proposed.

DONCASTER CORPORATION BILL.—The ratepayers of Doncaster at a town's meeting have defeated the clauses in the Corporation Bill for the sale and hire of electrical fittings. A poll was subsequently demanded, but it was stated that if the Corporation persisted in including the clauses, the Bill would be opposed in Parliament by the Chamber of Commerce.

STANDING ORDERS.—The County Council of the West Riding of Yorkshire has presented memorials against the Rotherham Corporation Bill and the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board Bill, alleging non-compliance with standing orders. In each case the allegation is that the promoters have not obtained the consent of the Council, who are the road authority for the construction of certain tramways.

Preferential Terms.—In a letter to the *Municipal Journal*, Mr. H. Faraday Proctor, hon. secretary of the I.M.E.A., deals with the question of power rate and photo printing, as follows:—In the issue of the *Municipal Journal* of December 25th, 1914 (Ref. 101), is published an inquiry from the chairman of an Electricity Committee, asking whether it is illegal to supply current at power rate for photo printing. The town clerk of the undertaking in question and the *Municipal Journal* express the opinion that such a practice is illegal, as it is lighting, and not power. I should like, most emphatically, to protest against such a ruling.

It must be remembered that electrical undertakers do not sell either light, heat or power. Their commodity is electrical energy, and when such energy is used for photo printing it is not used as an illuminant, but for its actinic properties—a purely commercial use; and may certainly, therefore, be sold as power.

If the argument held good that electricity used for photo printing must be considered lighting and sold as such, then all luminous radiators would come under a similar ruling.

The ultimate purpose for which energy is used must be taken into consideration in determining whether such use is lighting, power or heating, and a moment's consideration will make this clear. In all electric lighting the energy is used primarily to heat the carbons or filaments in the lamps to such a temperature that they produce light, but would anyone suggest that all such energy must be sold at the heating rate? The natural corollary would be the abolition of all lighting rates.

Appointments Vacant.—Two shift engineers (£2); fitter for County Asylum, Whalley, near Blackburn; power station superintendent (£175) for Maidenhead Electricity Works; engineer-in-charge (£2 15s.) for Sunderland Electricity Department; junior engineers (25s.) for Cleveland and Durham Electric Power, Ltd., Middlesbrough; electrician-in-charge for the Callan Electric Lighting Society, Ltd., Callan; electrician (35s.), for Croydon Mental Hospital; meter tester (35s.), for Salford electricity works; assistant electrical engineer (£300), for Government of Nigeria. Particulars are given in our advertisement pages

Institution and Lecture Notes.—Institution of Electrical Engineers.—The following items appear on the programme of the BIRMINGHAM LOCAL SECTION for the second half of the session :—

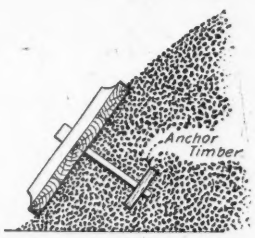
January 29th.—"Lord Kelvin's Work on Gyrostatics," by Prof. A. Gray.
February 10th.—"Polyphase Commutator Machines," by Mr. N. Shuttleworth.
March 3rd.—"Electricity Applied to Mining," by Mr. C. P. Sparks.
March 17th.—"Electric Cooking, mainly from the Consumers' Point of View," by Mr. W. R. Cooper.
April 14th.—"The Bombay Hydro-Electric Scheme," by Mr. A. Dickinson.
April 28th.—"The Power Supply to the Rand Mines," by Mr. J. H. Rider.
May 12th.—Annual meeting.

MANCHESTER LOCAL SECTION.—At the meeting on Tuesday last a paper was read by Dr. S. P. Smith and Mr. R. S. H. Boulding, B.Sc., on "The Shape of the Pressure Wave in Electrical Machinery." The discussion was closed. The same paper was to be read in London last night.

SCOTTISH LOCAL SECTION.—At the meeting on Tuesday, Mr C. J. Beaver read his paper on "Cables." The meeting was held in Edinburgh, and there was a large muster of East of Scotland delegates.

Rugby Engineering Society.—On Tuesday last, a paper on "Modern Electric Lighting" was read by Mr. H. C. Wheat.

Anchor Boards for Coal Pile.—The accompanying sketch shows a method of preventing coal piles from spreading at the base, by enclosing the lower parts of the pile in courses of timbers anchored from within the pile itself. As the coal is filled in over the anchor timbers the weight of the coal serves to



ANCHOR CONSTRUCTION TO PREVENT COAL PILE FROM SPREADING.

keep the outer portions of the pile from spreading. This construction is especially convenient where it is desirable to keep clear a pathway which would otherwise be engulfed by the flow of the lumps of coal. Unless some such protection is used, the jarring and sweeping of passing teams and persons will ordinarily cause the coal to run down a grade very much less than its ordinary angle of repose.—*Electrical World.*

The Electrically-Propelled Super-Dreadnought "California."—Particulars now to hand show what important reinforcements and modifications have been made possible in the design of the United States first-class battleship *California* by the adoption of electric propulsion. Like her sister ships the *Nevada* and *Oklahomah*, the *California* is to rely exclusively on oil fuel, but the further saving in weight of bunkers, boilers, piping and condensers and in space occupied by these has made possible important additions to the armouring and armament of the vessel, besides improving conditions within her by less heating and less crowding of equipment. The *California* is to carry 12 14-in. guns (in four triple turrets) besides four submerged 21-in. torpedo tubes and a secondary armament of 22 5-in. guns. Her armouring is said to be the heaviest yet carried by any battleship. Besides a main belt 14-in. in thickness, special horizontal and vertical internal armouring is provided to guard against fatal injury by submarine attack. The concentration of power equipment low down in the hull greatly increases the stability of the vessel (notwithstanding the reduced total weight of the equipment) and permits the secondary armament to be placed higher, the main armament to be increased materially and the armouring to be increased, particularly by the use of 16-in. armour in the conning tower and communication tube and the provision of a truncated cone of 14 in. armour round the base of the funnel. The total boiler capacity being reduced about 50 per cent. by the use of electric propulsion, all the boilers can be placed beneath a single uptake, and by armouring the base of the latter, the risk of damage in this vital spot is greatly reduced.

With a length of 625 ft., beam 97 ft. 3 in., and draught of 29 ft., the *California* displaces 32,000 tons. At 21 knots her power plant is designed to provide 32,000 shaft horse-power, probably by the use of four motors on two propeller shafts, though the final decision on this point has not yet been made public. The claims made in respect of the capital and working economies obtainable by electric marine propulsion have been justified completely by the performance of the U.S. collier *Jupiter*, the first large vessel to be propelled electrically, and one which has been tried by U.S. Navy experts against sister vessels fitted with triple-expansion engines and geared turbines respectively. The conditions of these tests and the subsequent voyage of the *Jupiter* from Mare Island Navy Yard to Hampton Roads leave no possibility of doubt concerning the superior efficiency and complete reliability of the electric system. The *Jupiter* being a vessel of 20,000 tons displacement, there is no reason to doubt that the advantages definitely established for electric propulsion in her case will be equally secured in the *California*. Supposing only four polyphase induction motors to be employed, each must be of 8,000 H.P., and motors already at work in rolling mills and other heavy industrial services show that there is no difficulty in building compact and reliable machines of such power to run at 200 R.P.M. or so, the terminal P.D. being, say, 2,500 volts. Due to the main turbo-generators continuing to run ahead at full speed (and that the speed of maximum turbine efficiency) under all circumstances while the propeller shaft is driven electrically at the low speed giving maximum propulsive efficiency, from 25 to 30 per cent. fuel economy is secured, the weight of propelling machinery is halved, and a net capital saving of 40 to 50 per cent. is effected. Saving in weight and space can be applied to armament in war vessels and to cargo capacity in merchant vessels. In all cases full power is available for manœuvring or reversal without altering the conditions of operation of the turbo-generators; and at reduced, or "cruising" speeds, very considerable economy is effected by shutting down part of the generating plant and running the remainder still under conditions of maximum efficiency. In a rough seaway the tendency of one propeller to race while another slows down is compensated automatically, since the speed of an induction-motor is practically independent of load; the output of the turbo-generator remains constant, but its distribution between the propeller-motors varies automatically.

It is a matter for congratulation that electrical engineering has provided the means whereby there has been effected, in a single step, far greater improvement in the overall efficiency of mechanically-propelled vessels, than had previously been effected during the past quarter of a century. Equally important is it, to shipowners, naval authorities and electrical manufacturers alike, that the magnitude of the economies due to electric ship propulsion has been established incidentally by the Navy Department of a first-class Power, to which reliability and technical efficiency are primary considerations.

The Coolidge X-Ray Tube.—We have received from the British Thomson-Houston Co., Ltd., of Mazda House, Upper Thames Street, E.C., a price list and particulars of the Coolidge X-ray tube, for which they own the British patents. The tube, which was described in our issue of October 16th last, represents an enormous advance over previously existing patterns—as great a step as from the hand-regulated arc lamp of 50 years ago to the automatic flame arc of to-day—for it does away with the variability and delicacy of handling of the old type, and raises the X-ray generator to the rank of an instrument of precision, which can be readily adjusted to any desired intensity, over a range far beyond that of its predecessors, and enables the quality of the rays to be exactly reproduced as often as desired; the tube can be used continuously without change in "hardness," the focal spot is fixed, the same tube can be used for all kinds of work, and it has a life of at least 1,000 hours. The rapidity of work is also greatly increased, a matter of immense importance to the surgeon, and as rays can be emitted resembling the gamma rays of radium, the latter can be to a great extent replaced by the Coolidge tube. We understand that a large number of the new tubes are in use and giving excellent service in the military hospitals both at the front and in this country, a most fortunate circumstance for both surgeons and patients.

A Railway Levitated.—A writer on science in the *Evening Standard* includes in the list of scientific discoveries of 1914 the "levitated railway" of M. Bachelet. Apart from the fact that the railway was not at the time supposed to be "levitated," but only the cars, we may point out that its demonstration in New York in 1912 rather weakens its standing as "the second discovery that came during the year" 1914. We are told that "the idea of it was splendid, but, like all other ideas, it was entirely upset by the outbreak of war." But it was in May, months before the outbreak of war, that the idea was upset, and we did our share in exposing the fallacies upon which it was based; when the prospectus was issued in the first week of June, it fell flat. To credit the war with the failure of this fantastic scheme is ridiculous; but we believe that lapse of time has rendered the title much more appropriate now.

Relief Measures taken by Berlin Electrical Engineers.—The American *Electrical Review* states that the Electrical Engineers Society of Berlin, Germany, has made the following appropriations: For the Berlin Red Cross Society, 1,000 marks; for the fund to assist Germans in foreign countries, 1,000 marks; for the fund to assist families of those fallen in battle, 1,000 marks; for families dependent upon enlisted men, 500 marks; for the Society for Children's Kitchens, 100 marks; for the National Service to Women, 200 marks. The Society is further subscribing 500 marks monthly to a fund to be loaned without interest to electrical engineers in temporary need. An employment bureau has been organised by the Society in conjunction with the Verband Deutscher Electrotechniker and the Verein Deutscher Ingenieure to enable engineers out of employment to find positions vacated by those who have entered the military and naval service.

West Sussex.—The Light Railway Commissioners have granted an order for the construction of a light railway from Hunston to West Itchenor, West Wittering and East Wittering, and for the reconstruction and working as a light railway of the Hundred of Manhood and Selsey Tramway.

Australian Action Settled.—Reuter dispatches from Melbourne state that the Vacuum Oil Co. issued a writ against the *Melbourne Age*, claiming £23,000 damages for an alleged libel contained in an article entitled "Trading with the Enemy," and that the paper has withdrawn its statements and apologised.

Foreign Trade.—THE DECEMBER FIGURES.—The following are the electrical and machinery figures given in the official returns for December :—

IMPORTS.	*Month of December.*	*Inc. or dec.*	*Twelve months, 1914.*	*Inc. or dec.*
Electrical goods and apparatus, excluding machinery and uninsulated wire ...	£ 89,916	— 65,631	£ 1,241,933	—345,361
Machinery	544,236	— 78,648	6,704,389	—578,582
EXPORTS.				
Electrical goods and apparatus, excluding machinery and uninsulated wire ...	184,363	— 162,101	3,017,693	—2,368,380
Machinery ...	...1,456,281	—1,501,175	31,335,218	—5,677,417

Auxiliary Steel Trolley Wire. — According to the *Electric Railway Journal*, excessive wear on the No. 0000 copper trolley wire on the 6,600-volt single-phase lines of the Chicago, Lake Shore, and South Bend Railway made it necessary to install a No. 000 steel auxiliary contact wire last year, which is suspended 1¾ in. below the copper line on 2-in. duplex clips. About 103 miles of steel wire is in use exclusively on mast arm construction, although it is to be tried on span-wire suspension. The change transferred the wear to the galvanised iron sliding pantograph shoes, which gave only 2,500 miles per shoe between renewals. To overcome this trouble two pieces of half-oval mild steel, ⅜ in. × 1½ in. section, were substituted for the 12-gauge galvanised iron sliding pantograph shoes, raising the useful life of the shoe to 9,000 miles. The average cost of the new shoes is 15 cents for material and 30 cents for labour.

Fatality.—Harry Dalton (51), a tramguard in the employ of the Manchester Corporation tramways department, died on Saturday in the Stockport Infirmary from injuries received on the previous day through being crushed between the fenders of two tramcars. He was attending to his trolley at the time, and was trapped between the two cars, his thigh being fractured.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials. — At last week's meeting of the Swansea Electric Lighting and Tramways Committee, MR. W. J. BUBB, the new borough electrical engineer, reported that he had been very loyally received by the staff at the station. The Committee expressed appreciation of the services of the staff, and especially of Mr. Rees, who had acted as the borough electrical engineer for some months during a period of extreme difficulty.

MR. W. N. PRITCHARD is no longer assistant engineer at Market Drayton electricity works, having taken up a similar position at the Newport (I. of W.) electricity works.

MR. A. C. NORTH, switchboard attendant at Middleton electricity works, has resigned upon receiving another post, and MR. W. BOWER has been appointed in his place.

We regret to learn from MR. A. J. BECKETT, of Bridlington, that our last week's reference to him was not quite correct. He was offered a commission by the colonel commanding, and had accepted it, but his papers had not been passed. The latter part of the paragraph is accurate in the event of Mr. Beckett receiving a commission.

MR. S. WHITEHOUSE, sub-station superintendent at the Walsall electricity works, has resigned his appointment. MR. J. D. SPARK, of Swansea, has been appointed mains engineer at Walsall, and MR. P. HUGHES has been appointed meter inspector.

MR. PENFOLD, second chief engineer at the Dover Corporation electricity works, has enlisted in the London Engineers, and the T.C. has appointed MR. WILSON to fill his place.

MR. HITCHCOCK, shift engineer at the Tonbridge electricity works, having joined the East London Engineers, the U.D.C. has appointed as his successor MR. O. CANTLE, of the staff of the Kent E.P. Co., who was formerly at the Tonbridge works.

MR. JOSEPHS, shift engineer at the Gillingham (Kent) electricity works, having left to join the Army, MR. ALFRED E. HARDY, of Larbert, N.B., shift engineer with the Scottish Central E.P. Co., has been appointed to succeed him.

MR. T. ARNOLD TAYLOR has resigned the post of mains superintendent, which he has held since February last, with the Corporation of Sunderland, and has accepted the post of assistant engineer with the Burmah Electric Tramways and Lighting Co.

Tramway Officials.—The Reading T.C. has increased the salary of MR. J. MCLENNAN CALDER, chief assistant tramway engineer, to £220 a year, rising by two further annual increments of £15 to £250.

MR. JOSHUA BRIERLEY, who has held the position of traffic superintendent on probation in the Oldham tramway department, has now been appointed permanently to the position.

General.—Messrs. Preece, Cardew & Snell inform us that they are taking into partnership MR. JOHN HALL RIDER (who will join them in April), on his retirement from the position of consulting electrical and mechanical engineer to the Central Mining and Investment Corporation, Ltd., and Rand Mines, Ltd., Johannesburg. Mr. Rider was, previously to his going to South Africa in 1910, electrical engineer to the London County Council tramways for nine years. The partners will be Mr. A. H. Preece, M.Inst.C.E., &c., Sir John Snell, M.Inst.C.E., M.I.E.E., &c., Mr. Llewellyn Preece, M.Inst.C.E., &c., Mr. J. H. Rider, M.Inst.C.E., &c., Mr. J. H. Woodward, A.M.I.C.E., &c., and Mr. S. Moore Ede, A.M.I.C.E. The designation of the firm after March will be Preece, Cardew, Snell & Rider, and the offices will be as heretofore at 8, Queen Anne's Gate, Westminster.

The *Manchester Courier* states that the directors of the British Engine, Boiler and Electrical Insurance Co., Ltd., have appointed MR. HARRY M. LONGRIDGE, B.A. (Cantab.) to be manager of the company. He has been in the service of the company for 10½ years. His grandfather, Mr. R. B. Longridge, who recently died at the advanced age of 93, was the pioneer of boiler inspection and insurance. Mr. H. M. Longridge is a son of Mr. R. Charles Longridge, the present managing director of the company, and a nephew of Mr. Michael Longridge, the chief engineer. Both of these gentleman will now partly relinquish active work.

MR. JAMES BANKS, one of the superintendents of the telegraph department in the Edinburgh Post Office, has retired under the Civil Service regulations as to the age limit, after nearly 50 years' service. Mr. Banks received from the members of the staff practical recognition of the esteem in which he was held. He is succeeded by MR. T. WARDEN, whose place is taken by MR. J. N. PRESCOTT.

Obituary.—MR. J. WRIGHT.—The death occurred on January 3rd of Mr. John Wright, sen., for many years a member of the firm of John Wright & Son, electrical engineers, Dover. Deceased, who was in his seventy-third year, was a Past Master of the Corinthian Lodge of Freemasons, and a prominent Conservative. The business will be carried on by his sons, Messrs. John and Edward Wright, the latter of whom has managed the electrical branch.

MR. MOSES STOKES, superintendent of Darwen tramways, died on Sunday night. Deceased went from Liverpool to the tramways department at Darwen 30 years ago.

NEW COMPANIES REGISTERED.

D. & M. Synd (Hollister's Patents), Ltd. (138,898).—This company was registered on January 6th, with a capital of £2,500 in £1 shares, to carry on the business of electricians, electrical and mechanical engineers, manufacturers and workers of and dealers in electricity, motive power and light, etc., and to enter into an agreement with F. L. Hollister. The subscribers are: F. L. Hollister, 8, Upper John Street, Golden Square, W., engineer, 25 shares; G. R. Taylor, 6, South Square, Gray's Inn, W.C., managing clerk, one share. Private company. The number of directors is not to be less than three or more than five; the first are not named. Qualification, £25. Solicitor: A. W. Osmond, 6, South Square, Gray's Inn, W.C.

Perfection Light Co., Ltd. (138,901).—This company was registered on January 6th, with a capital of £2,000 in 40 founders' and 1,000 pref. shares of £1 each, and 3,840 ordinary shares of 5s. each, to take over the business carried on at 5, Victoria Street, Westminster, and at 39a, Lower Kennington Lane, S.E., as the "Perfection Light Co.," to carry on the business of mechanical, gas, electrical and domestic engineers, manufacturers of and dealers in engines, machines, dynamos, lamps, wire, pipes, mantles, burners, insulating materials, accumulators, petrol and other oils, etc., and to enter into certain agreements, the parties to which are not named. The subscribers (with one share each) are: L. J. D. Gibson, Thicket Side, Maidenhead Thicket, Berks, civil engineer; F. Bradley, 60, Braxted Park, Streatham, S.W., civil engineer. Private company. The number of directors is not to be less than two or more than five; the first are L. J. D. Gibson and F. Bradley (joint managing directors). Registered office: 5, Victoria Street, S.W.

Midhurst and District Electric Supply Co., Ltd. (138,886).—This company was registered on January 5th, with a capital of £7,500 in £1 shares, to carry on the business indicated by the title, and to adopt an agreement with B. E. G. Bailey, Hon. W. H. M. Pearson, and T. Stallibrass. The subscribers are: B. E. G. Bailey, The Old House, Midhurst, medical practitioner, 50 shares; A. Farley, Beachey House, Midhurst, merchant, 50 shares; J. Gwillim, North Road, Midhurst, 50 shares; W. H. M. Pearson, M.P., Capron House, Midhurst, 50 shares; T. Stallibrass, Rumbolds Hill, Midhurst, railway agent, 50 shares; Sir Stephen G. Sale, K.C.I.E., Heather Wood, Midhurst, 2,000 shares; R. P. Brousson, 47, Parliament Street, S.W., electrical engineer, 50 shares. Minimum cash subscription, 20 per cent. of the shares offered to the public. The number of directors is not to be less than three or more than seven; the first are B. E. G. Bailey, W. H. M. Pearson, M.P., and R. P. Brousson. Qualification, 50 shares. Remuneration as fixed by the company. Solicitor: G. C. Clarence, Market Place, Midhurst, Sussex.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Abingdon Electric Supply Co., Ltd.—Particulars of £3,000 debs., created December 31st, 1914, and secured by trust deed of even date, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital, and leasehold hereditaments at Abingdon. Trustees: J. H. Edwards, Haresfield, near Stonehouse, Glos., and A. A. Douglas, Brendon, Queen's Drive, Colwyn Bay, Denbigh.

Suffolk Electricity Supply Co., Ltd.—Issue on December 14th, 1914, of £750 debs., part of a series of which particulars have already been filed.

Royce, Ltd.—Capital, £170,000 in £1 shares (7,000 pref.).—Return dated July 13th, 1914. 34,955 pref. and 72,487 ord. shares taken up; £1 per share called up on 4,955 pref. and 6 ord. and 15s. per share on 30,000 pref. shares. £27,461 paid; £79,981 considered as paid, being £1 per share on 72,481 ord. and 5s. per share on 30,000 pref. shares. Mortgages and charges, nil.

Maxim Lamp Works, Ltd.—A memorandum of satisfaction in full on December 30th, 1914, of charge dated September 29th, 1910, securing £1,060 3s. 10d., has been filed.

Ely Valley Lighting Co., Ltd.—Capital, £5,000 in £1 shares. Return dated September 24th, 1914. 3,471 shares taken up; £3,468 5s. paid; leaving £2 15s. in arrears. Mortgages and charges, £880.

Wardle Engineering Co., Ltd.—Capital, £5,000 in £1 shares (2,000 pref.). Return dated July 29th, 1914. 2,885 ord. and 1,330 pref. shares taken up. £4,015 paid; £200 considered as paid. Mortgages and charges, nil.

Maud & Turner, Ltd.—Particulars of £4,000 debs., created December 30th, 1914, and secured by trust deed dated January 1st, 1915, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital and land with Perseverance Works, at Half Mile, Thorn, Halifax. Trustees: Harriet Maud and E. Booth.

General Accessories Co., Ltd. (104,464).—Capital, £3,000 in 1,580 six per cent. pref., 820 five per cent. pref., and 500 ord. shares. Return dated August 28th, 1914 (filed Nov. 12th). All shares taken up. £1,580 paid; £1,420 considered as paid. Mortgages and charges, nil.

Electro-Mechanical Brake Co., Ltd. (98,276).—Capital, £20,000 in 2,500 six per cent. cum. pref. and 17,500 ord. shares of £1 each. Return dated October 9th, 1914. 987 pref. and 16,317 ord. shares taken up; £1 per share called up on 987 pref. and 10,282 ord.; £11,269 paid; £6,035 considered as paid on 6,035 ord. Mortgages and charges, nil.

Frinton-on-Sea and District Electric Light and Power Co., Ltd. (70,689).—Capital, £10,000 in 2,700 ord. and 73,000 pref. shares of £1 each. Return dated October 8th, 1914. 1,376 ord. and 5,125 pref. shares taken up; £6,501 paid. Mortgages and charges, £6,000.

CITY NOTES.

Tata Hydro-Electric Power Supply Co., Ltd.

THE *Englishman* states that Sir D. J. TATA presided at the annual meeting on December 3rd. He referred to the doubts and fears about the scheme in the form of bazar rumours, and in order to remove them read a report by Mr. Joyner, the Company's Hydraulic expert. Mr. Joyner states that the dams are twice as strong as Kharakwashla dam, ten miles from Poona, which was built forty-six years ago and which is still absolutely sound and has never shown any tendency to be otherwise. The water supply too is expected to be better than was originally anticipated for whereas the estimate was that 62 per cent. of the rainfall would be collected during the past two monsoons, it has been found that the proportion running off the catchments is 80 per cent. in addition to which the cool surface of the lakes condensing damp air has caused heavier rain to fall on them. The ducts and forebay are described as "eminently suitable for their purpose in every respect" and the ducts will carry sufficient water to give 100,000 e.h.p.

Sir DORAB, referring to the future of the company, roughly estimated that 160,000 H.P. would be required to meet the demand of Bombay, but as the full capacity of the present lakes could not possibly meet such demand it was resolved to find out a suitable site near Bombay, possessing advantages similar to those of the present scheme. Mr. Gibbs, general manager, has been successful in discovering other valleys in the Ghauts. With the sanction of Government survey parties have been at work. The whole problem is being considered by expert advisers.

Llandudno and Colwyn Bay Electric Railway, Ltd.

THE directors' report for the year to November 30th, 1914, states that the profit after providing for operating and administration expenses and interest on debenture stock, amounts to £5,144, plus £919 brought forward. There has been applied in providing for sinking fund instalment, due January, 1915, £1,475, and in writing off discount on debenture stock issued during year £50, leaving £4,538. The directors recommend a dividend at the rate of 4 per cent. per annum (payable, less income tax, on January 30th, 1915), absorbing £3,976, carrying forward £562.

The traffic receipts show a decrease of £2,039, which is entirely due to the interruption of the holiday season consequent upon the outbreak of war, the receipts up to that period slightly exceeding those of the previous year. The receipts since the close of the financial year have been fully maintained.

The sinking fund in connection with the debenture stock has again been provided out of the revenue for the year, and the directors consider that this provision is sufficient to meet depreciation. The extension to Old Colwyn is now being carried out and will be completed in a few weeks. The doubling of the track from the end of Mostyn Avenue to St. John's Chapel in Llandudno was carried out during the year, and it is satisfactory to record that this work was carried out without seriously handicapping the working of the system.

Reduction of Capital.—TURNERS & MANVILLE, LTD. (AND REDUCED).—A petition for confirming the reduction of the capital from £50,000 to £39,994 has been presented, and is now pending. List of creditors of the company is to be made out as for February 17th.

Companies Struck off the Register.—The following companies have been struck off the Register, and are accordingly dissolved:—

Automatic Glass Blowing Patents Syndicate.
Automatic Weldless Chain Co.
Auxiliary Power Co.
Bishop's Stortford and Stansted Electric Lighting Co.
British Electric Light Wiring Co.
British "Ever-Ready" Electrical Co.
Burkel Tram Rail Syndicate.
Caurlcedale Anti-Friction Metal Syndicate.
Concentric Condensers,
Cumberland Power Syndicate.
Economic Furnaces.
Metals Finance.
National Automatic Fire Alarm Co.
Penmachno, Corwen and Bettws-y-Coed Light Railway Co.
Positive Rotary Pumps.
Technical Advertising.
Traction and Power Agency.
Wolfram (Tungsten) Syndicate.

Sydney Electric Light and Power Supply Corporation.—According to an Australian paper just to hand, this company is reporting on the four months ending October 31st last, states that the new business continues satisfactory, and that during the period mentioned there has been an increase of 325 consumers. The profits for the four months amounted to £8,122, which, after paying a dividend at the rate of 7 per cent. for the period, and deducting £468 as portion of debenture flotation expenses, left a balance of £3,667 to be carried forward. Consumers have increased at the rate of nearly 40 per cent. per annum. After allowing for the interest payable on the first and second debentures, the balance of profit would be sufficient to pay roughly about 2 per cent. on the shares issued, but the directors have adopted a conservative policy, and are only paying the usual rate of 7 per cent. per annum.

Victoria Falls and Transvaal Power Co.—The *Financial Times* states that a circular has been issued to the shareholders of this company, stating that business since the last report has continued to make satisfactory progress, the war not having interfered with the undertaking in South Africa. The amount of power now being delivered shows an increase over that of June last. That is reflected in profits, which show a steady increase since the beginning of last year. In connection with the erection of new plant at Brakpan, the first extension set will be in commission within a month, and the second set will be available for service two months later. Fresh demands for power requirements are being received.

Electric and General Investment Co., Ltd.—The directors announce, says the *Financial Times*, that as they consider it advisable during the continuance of the war to conserve cash resources they do no propose to pay any interim dividend on the preference or ordinary shares.

Direct United States Cable Co., Ltd.—Interim dividend 2s. per share, less income-tax at 2s. 1d. in the £, (being at the rate of 4 per cent. per annum for the quarter ended December 31st, 1914), is payable on and after 31st inst.

Stock Exchange Notice.—The Committee has been asked to allow the following to be quoted in the Official List:—

London and Suburban Traction Co., Ltd.—£350,000 5 per cent. "A" Debenture stock.

Kaministiquia Power Co., Ltd.—Dividend 1½ per cent. on the common stock for the quarter ending January 31st.

Rio de Janeiro Tramway, Light and Power Co., Ltd.—A dividend of 1½ per cent. is announced.

Sao Paulo Tramway, Light and Power Co., Ltd.—A dividend of 2½ per cent. is announced.

Westinghouse Brake Co., Ltd.—A dividend at the rate of 20 per cent. per annum for the half-year ended December 31st is announced.

STOCKS AND SHARES.

Tuesday Evening.

Stock Exchange fears, which assumed so bulky a shape when the Treasury requirements for reopening the House became known, have already begun to fade away now that the actual conditions of working show them to be less terrifying than they appeared in prospect. In spite of the fact that all speculation is stopped and that business is confined purely to investment orders, markets find a fair amount to do; while the advantage of being able to deal under shelter, and with dry feet, is certainly one that appeals in the wet weather that is not unknown in London these days.

What the papers call the release of the January dividends brought a certain amount of money to the stock markets. The most popular security of the moment is the War Loan, and, this apart, interest continues to centre mainly upon gilt-edged securities. It is a matter of no little astonishment to find how keen is the demand still for all kinds of electrical debenture stocks. Shares fluctuate: they have their weeks of favour and disfavour with the public, but for the higher-grade issues the

demand is constant and insistent. Buyers of course think that they ought to get stock a great deal cheaper than the prices at which it is offered, and disappointment still lingers that the war should have produced so few opportunities for bargain-hunting. Remains, however, the fact that most shares —and our list of electricity supply descriptions illustrates this —can be bought considerably cheaper than before the outbreak of war, when, it must be remembered, quotations had already suffered a severe shrinkage because of the abnormal financial conditions that prevailed for weeks before the storm actually burst upon Europe.

The last few days have been noticeable mainly for further advances in Home Railway stocks. With dividend declarations so near at hand, and with all dealings for cash only, the bears have had an uncomfortable time, their anxiety not being lessened by the readiness with which small investors are buying odd lots of the best-known stocks. Why the electrical railway issues should have been overlooked it is difficult to say. They are likely to have their turn before long; and a recovery in Underground Electric income bonds and shares is an indication that this group is not without friends.

London and South Western 5 per cent. preference stock, issued to pay for partial electrification of the system, is well held at 103; but Metropolitan preference continues at a small discount. Work on the London and North Western electrification scheme seems to have been largely checked, no doubt in consequence of the war. There was great activity to get the new station at Chalk Farm finished before the autumn, but present operations are being carried out on a much smaller scale, the Company's men no doubt being required for handling the troop-traffic, and being denuded, of course, by the hundreds who have joined the colours.

The St. James' Electric Supply is usually the first of the electrical companies to declare its dividend, though chased very closely by the Westminster, and followed shortly after by the Brompton and the others in the London group. The question before directors at present probably is whether they shall deplete reserves and pay the same dividends as a year ago, or whether they shall distribute smaller payments and keep up the appropriations. Last August, it may be recalled, the tendency was in the former direction; and the boards will now have to shape their policy according to their views with regard to the duration of the war. The uncertainty prevailing on the point no doubt has something to do with the continued quietude in the share market. It will be seen from the following prices how trifling the changes are :—

HOME ELECTRICITY COMPANIES.

	Mean price. July 27.	Jan. 12, 1915.	Rise or fall this week.
Brompton Ordinary	91½	87½	+ ½
do. 7 per cent. Pref.	88	88	—
Charing Cross Ordinary	5½	4⅞	+ ⅛
do. do. do. 4½ Pref.	4⅜	4¼	—
do. do. City Pref.	4⅜	4	—
do. 4 Deb.	91⅛	90	+ 1
Chelsea	4⅞	4⅝	—
do. 4½ Deb.	96½	92	+ ½
City of London	16	14⅝	—
do. do. 6 per cent. Pref.	19¼	18	—
do. do. 5 Deb.	116½	114	—
do. do. 4½ Deb.	100½	98	—
County of London	12	11¼	—
do. do. 6 per cent. Pref.	12	11⅝	+ ⅛
do. do. 1st Deb.	102½	99	—
do. do. 2nd Deb.	10⅛	97	—
Kensington Ordinary	7½	7⅛	+ ⅛
London Electric	1 7/16	1½	—
do. do. 6 per cent. Pref.	5 1/16	5	—
do. do. 4 Deb.	99½	89½	—
Metropolitan	3⅝	3½	+ ⅛
do. 4½ per cent. Pref.	4 7/16	4⅜	—
do. 4½ Deb.	97½	91½	—
do. 3½ Deb.	84	81½	—
St. James' and Pall Mall	9⅝	9	—
do. do. do. 7 per cent. Pref.	7	6⅞	—
do. do. do. 3½ Deb.	84½	83½	+ ½
South London	3 7/16	3	—
South Metropolitan Pref.	1¼	1⅛	—
Westminster Ordinary	8⅝	8⅜	— ⅛
do. 4½ Pref.	5⅛	4⅞	—

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pf.	109¼	109½	—
do. Def.	23	21⅞	—
Chile Telephone	7⅜	7⅛	+ ⅛
Constantinople Tel.	4¼	4	—
Cuba Sub. Ord.	8⅝	8½	—
do. Pf.	16½	15⅞	—
Eastern Extension	12¾	12½	+ ¼
do. 4 Deb.	97⅛	94	—
Eastern Tel. Ord.	130½	129	+ 1
do. 3½ Pf.	77⅛	74⅛	+ 1
do. 4 Deb.	96¼	95	—
Globe Tel. and T. Ord.	11¼	10	— ¼
do. Pf.	12½	12¼	— ¼
Gt. Northern Tel.	32½	28	—
Indo-European	59	57	— 1
Marconi	1 15/16	1 13/16	+ 3/32
New York Tel. 4½	101	96½	+ ½
Oriental Telephone Ord.	2 5/16	2	—
do. Pf.	1 5/16	1 1/16	—
Tel. Egypt Deb.	98	97½	+ ½
United R. Plate Tel.	6⅝	6	—
do. Pf.	5½	5	—
West India and Pan.	1½	1½	—
Western Telegraph	18⅝	19⅞	+ ⅛
do. 4 Deb.	96½	95½	—

HOME RAILS.

Central London, Ord. Assented	83	79	—
Metropolitan	37½	31½	+ ½
do. District	21⅞	18½	+ ½
Underground Electric Ordinary	2⅜	1⅝	—
do. "A"	7/6	6/-	—
do. Income	88	80	+ 1

FOREIGN TRAMS, &c.

	Mean price. July 27.	Jan. 12, 1915.	Rise or fall this week.
Anglo-Arg. Trams, First Pf.	4⅞	4½	—
do. 2nd Pf.	4¼	4⅛	—
do. 4 Deb.	91	86	—
do. 4½ Deb.	98½	96	—
do. 5 Deb.	96	89	—
Brazil Tractions	66	58	+
Bombay Electric Pf.	11⅜	10½	—
do. 4½ Deb.	96	95	—
Mexico Trams.	70	45	—
do. 5 per cent. Bonds	84	70	—
do. 6 per cent. Bonds	76	65	—
Adelaide S.p. 6 per cent. Pf.	5¼	5⅛	+ 1/16
do. 5 Deb.	104	100½xd.	—

MANUFACTURING COMPANIES.

British Westinghouse Pref.	1⅞	1⅞	—
do. 4 Deb.	74½	72	—
do. 6 p. lien	103½	98½	+ ½
Callenders	11⅝	11⅝	—
do. 5 Pref.	5⅜	4¾	—
do. 4½ Deb.	96½	96	+ ½
Castner-Kellner	2⅛	2⅛	—
Edison & Swan, £8 pd.	12/6	12/6	— 6d.
do. do. fully paid	2½	2½	—
do. do. 4 Deb.	59	60	—
do. do. 2 Deb.	62½	60	—
Electric Construction	11/-	11/-	+ 1/-
do. do. Pf.	1	1	—
Gen. Elec. Pf.	10⅞	10	—
Henleys	18	18	—
do. 4½ Pref.	5	5	+ ½
do. 4½ Deb.	100½	97	—
India-Rubber	9	8½	—
Telegraph Con.	38½	36	—

It will be noticed that Edison & Swan shares have given way a little after their drive up, when the price went to nearly 15s. The reaction is due to the disclaimer issued in semi-official manner as to the company being largely engaged in work for submarines. The fully-paid shares are unchanged at 2½. Electric Constructions are better at 11s., standing now higher than they did when war broke out. The manufacturing shares of the Telegraph group are very firm.

Telegraph securities themselves are remarkably quiet. There has been more demand for Eastern ordinary, while Eastern Extensions, at 12½, are the fraction higher on the week. The Anglo-American group is steady, and the reception accorded to Sir Edward Grey's reply to the United States' protest on the subject of contraband has been sufficiently favourable to cause general satisfaction. Marconis, after being 1⅝ buyers, developed a slightly duller tone. American Marconis rose to 11s., but reacted to half-a-guinea; Canadians remain in the neighbourhood of 4s. 6d.

Brazil Tractions are better at 58, regaining their previous fall. A number of enquiries have reached the market as to whether there is any premium to be obtained on the new Calcutta Electric Supply ordinary and preference; but in view of the very slight difference which exists between the old and new, taking the two together, there is no profit at present for the applicant. The rubber market is better, thanks to Sir Edward Grey's promise to raise partially the embargo placed upon exports to the United States. The armament group has no feature to render it conspicuous.

Last Sunday, by the way, the special constables of Wimbledon, Fulham, Barnes and other places received peremptory orders, as they were finishing their dinners, to proceed at once to their points of duty; and power stations, being regarded as amongst the most vulnerable points, received rapid reinforcements from those whose afternoon nap was thus rudely disturbed. The occasion for this call was, of course, the appearance of German aircraft on the French coast; and the R.N.V.R. men, who are in charge of searchlights and guns, spent several exciting hours in watching for the enemy from the high points round London. Reservists and Special Constables were happily disappointed, but the false alarm has revived the previous anticipation of visits from alien air-craft.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month.		No. of weeks.	Total to date.		Route miles open.	
		£	£		£	£		Inc.
Bath	Jan. 6	2,917	— 114	1	647	— 48	..	..
Blackpool-Fleetw'd	,, 9	1,346	+ 5	1	456	— 35	8	..
Bristol	,, 8	37,182	+4,091	1	10,190	+ 199	30·5	..
Chatham and Dist.	,, 7	4,018	+ 367	1	970	+ 146	14·98	..
Dublin	,, 8	23,540	+2,263	1	5,821	+ 586	54·25	..
Cork	,, 7	1,852	+ 46	1	459	— 55	9·89	..
Hastings	Dec. 31	3,920	— 95	..	..	— 3,190	19·3	..
Lancashire United	Jan. 6	6,391	— 51	1	1,772	+ 101	42	..
Llandudno-Col. Bay	,, 1	694	+ 51	4	694	+ 51	6·5	..
Tyneside	Dec. 30	2,087	+ 87	27	16,116	+ 2,185	11	..
Anglo-Argentine	Jan. 7	215,217	—32,59	1	52,720	— 5,847	..	..
Auckland	Dec. 18	20,414	+2,763	25	124,932	+15,127	25·42	1·06
Calcutta	Jan. 9	16,799	—1,952	..	..	+ 1,081	..	..
Kalgoorlie, W.A.	Sept.	2,864	..	29	23,980	..	..	..
Madras	Dec. 31	3,725	— 182	52	44,441	+ 1,495	..	..
Montevideo	Dec.	28,605	—4,705	9	55,686	— 8,154	..	..
Dublin-Lucan Rly.	Jan. 8	689	— 16	1	196	— 13	7	..

NOTES ON SWITCHBOARD ARRANGEMENT AND EQUIPMENT.

[COMMUNICATED.]

At one time it was customary to regard switchboards and their equipment as a nuisance—necessary but distinctly parasitic, and quite fitly to be placed in any odd corner, too small, or otherwise unsuitable, for any other equipment. Often the boards were much whited sepulchres, architecturally ornate and resplendent in marble and brass, but covering a multitude of faulty points in construction or design. Some of the defects involved only inefficiency; others actual danger to life and property. Painful experience, more frequent in its occurrence as working pressures increased, compelled attention to this matter and brought home the fact that the switchboard is the vital link connecting the generating and distributing systems, so that comparatively trivial switchboard defects may easily suspend supply over a more or less extensive area. Recently switchboards and gear have been accorded respect befitting their importance, but even in modern installations defects in design and arrangement are found which are particularly objectionable and dangerous when, as often happens in industrial service, the board is under the control of a more or less unskilled attendant.

Frequently one finds a switchboard placed in a gallery "affording a clear view over the engine room" (as the text-books have it) when there is really no justification for this costly construction. In small stations of the one-man type the switchboard attendant (who probably enjoys the title of "engineer-in-charge," in recognition of the fact that he does everything that needs doing) is near enough to the engines to tell by sound what is happening to them, and that much more easily and certainly than he could tell by eye when in a gallery; and should he have cause to leave the board hurriedly to attend to the engines, it is a distinct advantage to have no steps to descend. In larger works, actual supervision of the engines from the switchboard is necessarily very superficial. Separate engines and switchboard staffs are required, and intercommunication by signals can be effected as easily from a floor board as from a gallery. In stations of either of the above classes a lofty gallery is an unnecessary and inconvenient expense, but the switchboard may well be mounted on a platform not more than two or three steps high; this arrangement improves the look of the station, permits the board to be conveniently railed off, and undoubtedly exercises some occult effect in emphasising the importance and sanctity of the board. In large modern stations of the high-tension type, a switch gallery is almost compulsory, owing to the depth required beneath the operating platform for cable races, transformers, and oil switches, &c.

In such stations remote control of engine or turbine valves is usually provided on the switchboard; the switchboard attendants work only on the board itself and find full employment there, and by the switchboard gallery overhanging the turbine aisles, space can be frequently saved as compared with the space required for ground level boards. Some of the low-tension boards controlling local and auxiliary circuits can still be placed advantageously on the walls of the engine room at ground level. The prevailing tendency is to separate generator, feeder, and section panels (to limit the scope of damage), while providing central remote control for all.

In the latest and largest power schemes there is an increasing tendency to locate the main switchgear in a building distinct from the power house itself, even going the length of providing a separate switch house for each generating unit in a large overland scheme. By such isolation the risk of wholesale interruption of supply due to cable and switch fire is much reduced, and the task of isolating and extinguishing a fire is greatly simplified. All pretence at direct engine room supervision from the switchboard is abandoned, and a complete system of signal telegraphs and remote control apparatus is arranged.

Simplicity in any switch installation is an invaluable aid to security, for the risk of trouble increases far more rapidly than the number of pieces of apparatus and component parts on the board. High-tension boards and switchgear can and must be interlocked very completely, but there is a tendency to overdo the automatic features and "fool-proofing" of industrial switchgear. In some directions foolproofing engenders or encourages carelessness, and even deliberate misuse of apparatus in order to see the automatic features work. Broadly speaking, safety and reliability are best assured by a minimum number of automatic features, all the expenditure permissible being devoted to making these and the fundamental components of the switchgear of the best material and design. The use, on metal parts behind boards, of insulation which might be inadequate under any circumstances, is inviting trouble; the metal concerned had far better be left bare and protected by a mechanical screen, or left obviously dangerous, or earthed, according to circumstances. Bare conductors behind the board reduce the risk of fire to a minimum. Asbestos is a flame-proof covering, but one which is apt to form a good "wick" for burning oil. Bare conductors must be so supported that they cannot be deflected dangerously by the enormous mechanical forces set up by short-circuit in a modern station. Portable electrostatic live wire indicators of the electroscope type should be used regularly by men handling high-tension switchgear and leads; naturally, the instrument should be of first-class design and construction, or it will introduce more risks than it will remove. Doors in the side or back of the enclosure behind the board should be on permanent hinges or slideways wherever possible, and should be interlocked with the main switches in the section to which they give access. If the doors be of the hang-on panel type, they should be entirely of insulating material with completely insulated reinforcement, if any, otherwise they are likely to cause disaster by coming in contact with live parts.

Low-tension, no less than high-tension, switches should be mounted with all live parts behind the board, and only the insulated handles in front; safety and good appearance are thus alike secured. In the past, on many boards, particularly of Continental origin, live parts on the front of the board have been covered by shields of fibre or papier mâché composition, easily damaged mechanically, and subject to rapid deterioration by damp. Such construction is unsightly, unsafe, and altogether false economy. In multipolar switchgear, with mechanically coupled phases or poles, the coupling-piece should be exclusively of insulating material; if it has a metal core, damage to the insulation will probably cause a dead short.

The design of oil-immersed switchgear can hardly be said to have kept pace with the revolutionary increase in power of generating sets and pressures of generation and distribution; the distance between live parts is often insufficient, and the total volume of oil in the box inadequate to prevent overheating. Switch parts should be as light as is consistent with strength, so that acceleration is a maximum for a given operating force, and there is advantage in using a mechanism which gets into motion before the actual break occurs. The containing case should be very strong and fitted with a relief valve, and the cell within which the switch is placed should be of fireproof construction and provided with a drain carrying away oil in case of fracture of the switch-box. Generator switches should usually be non-automatic, but have overload alarms operated by a current transformer; also alarms operating in case of abnormal oil heating. On important lines it is not extravagant to provide two switches in series, particularly if fitted with automatic gear, or if used very often or very seldom. Each switch is fitted with a bridging isolating switch, the latter being closed across the main switch which is held in reserve at the moment. Wherever oil switch or other oil fires are liable to occur, plenty of sand should be kept handy, and smoke helmets should be provided, for without the latter it is often impossible to reach the seat of conflagration.

The large generating sets now employed, and the low reactance of generators and transformers commonly adopted for the sake of good regulation, result in enormous short-circuit energy. It is doubtful whether any practicable oil switch can deal unaided with the conditions which may arise in a large modern station, and the alternative to sectionalising, so as to limit the short-circuit energy available behind any one switch, is to use two switches in series, or one special switch, so that supplementary reactance is

inserted automatically before the main switch opens. Earthing the neutral of three-phase systems is desirable so long as steps are taken to limit circulating currents during normal operation and to provide low-resistance earthing when really required. The use of switching-in or charging resistances is now common in all high-tension installations, and is particularly desirable when connecting circuits of high inductance or capacity. Without this precaution dangerous resonant cable surges may occur, and special insulation of motor and transformer end coils becomes necessary. The practice of running up a machine with its cables connected is of limited applicability, is crude, and by no means free from risks. Periodic testing of network insulation is a necessary and universal practice, but any method or instrument which gives graduated warning of the imminence and aggravation of faults is specially valuable. The telephone of a phasaphone, for instance, enables one to listen to the charge and discharge of a condenser connected between line and earth through a suitable resistance; irregular or incipient defects cause variations in the telephone note. Any measures leading to the prevention of faults are particularly valuable, since they not only prevent the first interruption of service, but save a further whole crop of trouble. Most central station statistics show that breakdowns occur in groups. The first serious breakdown causes surges which strain or even puncture insulation in other parts of the system; static discharges occur when working is recommenced, and a power discharge soon follows. Once started, there is often quite a long train of serious breakdowns at short intervals.

Instruments of the flange type with body sunk in the board are neat in appearance, easily cleaned and easily read—all advantages of special importance on large boards, and more than compensating for the extra cost involved. Classification of instruments by case diameter is obviously illogical, since the scale is quite likely to be smaller and less clear though the case diameter be larger. It is much safer and more definite to specify either the scale length or, what amounts to the same thing, the pointer length and maximum angular deflection. Such a basis is equally applicable to face and sector instruments of all types. Any instrument to be mounted above eye level should have at least 6½-in. scale length (or, say, 90° deflection of a 4½-in pointer); the advantages of modern long-scale instruments are well known. The merits of induction type instruments for alternating-current working include long-scale and all-glass front showing full pointer length. These instruments are simple and strong, and can be repaired by an ordinary meter adjuster. Their frequency error is high, but this is of no importance in a turbine station; the temperature error, which would be a more serious matter, is capable of close compensation.

The elementary precaution of placing all series and regulating resistances so that convected heat does not reach neighbouring instruments is often neglected, naturally to the prejudice of instrument accuracy. Errors due to this cause cannot always be detected even by *in situ* tests, for the offending resistances may be cool at the time of testing. Irregular operation of fuses is often traceable to their being mounted with similar disregard for the neighbourhood of regulating resistances; if the fuse is proportioned to carry a certain current when the resistance is hot, the circuit is inadequately protected when the resistance is cold. Induction from heavy current cables six or seven inches away often causes quite serious instrument error.

Instrument change-over switches placing instruments in various circuits or across various shunts are often built so lightly that they give trouble by imperfect contact or, what is more serious, cause short circuit by mechanical fracture. The back contacts of these and other switches should be fully accessible and not covered in by bus-bars or other apparatus. For calibrating purposes it is often desirable to connect standard instruments temporarily in circuit without interrupting operation, and to permit this with minimum trouble and risk, special terminals should be provided on isolating switch or fuse blocks in the first place so that, the current winding being connected, it remains only to open the bridging switch or fuse.

The frequency in modern turbine stations is practically constant, but not infrequently is lower than standard, owing to weakening of the control in the tachometer or other instrument used. A frequency meter switched in circuit only at intervals to check the regularly employed tachometer is a useful precaution. There is rarely need for a registering frequency meter, but the use of recording volt and watt-meters is in the interests of efficient working and supervision. It is a small matter to planimeter wattmeter records to save the use of watt-hour meters if both are not desirable for any reason; and the wattmeter record is very useful in distributing generator and feeder connections and settling tariff problems. Volt and wattmeter records are useful, too, in detecting and discriminating faulty conditions; for example, branches touching overhead lines cause smaller fluctuations than fallen wires or insulator defects, and imperfect contacts such as often occur in open-air high-tension isolating switches, cause violent fluctuations on volt-meter records but little on wattmeter records.

The design of good instrument transformers is now generally understood but not always practised. For trip coils and relays, accuracy of transformer ratio and phase are of minor importance, but for use with measuring instruments very light portable transformers are generally unsuitable. In large systems, transformers with small primary capacity may be destroyed by the mechanical forces set up during short circuit; specially heavy design is essential, and the secondary load should be as light and constant as possible, to secure highest accuracy. Often an installation can be cheapened and simplified by using one transformer for several instruments; the transformer should be designed liberally, so that an extra instrument can be connected to it at any time (the possibility of so doing will often be of great practical value). A single current transformer may supply a number of watt-hour meters, but should not be connected to other apparatus as well. Not infrequently it is neglected to earth the secondary measuring circuit, or otherwise make it impossible for the low-tension circuit to become "live" with high-tension current. A danger equally fatal and more serious in that it exists under ordinary working conditions if not safeguarded, is that of generators and leads being kept alive after the main switch is opened, by induction through synchronising transformers. The obvious remedy is to place an isolating switch ahead of all potential transformers, interlocking this switch with the main circuit switches. Besides fusing the primary side of voltage transformers, low-tension fuses should be placed in the secondary circuit to protect against incorrect connection, incorrect earthing, or short circuit, in leads or instrument. All instruments connected directly to bus-bars or mains should be fused, for the same reason.

AUTOMATIC PROTECTIVE SWITCHGEAR FOR AUTOMATIC CURRENT SYSTEMS.

By E. B. WEDMORE, M.I.E.E.

(*For abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS, *see* ELEC. REV., *p.* 37.)

DISCUSSION IN LONDON.

Mr. C. H. MERZ said that all these devices had been developed as the result of experience, which had shown the need of them. On the North-east Coast they were deeply interested in the matter as a commercial question. They had many long transmissions, and the system had naturally developed into a series of interconnected ring mains, supplied from sub-stations with attendants; in order to maintain continuity of supply in the event of a fault occurring, they had to have automatic apparatus that would cut out the faulty cable, no matter which way the current flowed. The result was the development of systems of protection. The conditions were different in the United States, where the distribution was largely by direct current through rotary-converter sub-stations; radial feeders were laid with each sub-station, and attendants were employed, so that ordinary overload devices were sufficient. In this country the tendency was to supply important consumers with three-phase current through static transformer sub-stations, hence the necessity for selective devices. The real question was not the cost of a particular piece of apparatus, but whether it was possible to improve the lay-out by using it and thus save perhaps 100 times its cost.

Mr. H. W. CLOTHIER said that the paper contained the condensed results of twenty years' work. It was difficult to induce the users of cables to think out the problems involved and to become themselves "selective." It was important to consider the case of T mains, as at J in fig 1.

Core-balancing on switchgear had been adopted extensively four years ago, and at least 100 circuits, to his knowledge, were protected with it to-day. Messrs. Merz and Price themselves did not fully realise the value of the system at first. He did not like the balanced relay system as applied to the case of parallel feeders; with regard to interlocked reverse-relays, he agreed with the author, and was surprised that they were still specified. Systems of protection of parallel feeders had a tendency to open the wrong switch in the event of a fault on open circuit, and they were useless where there were T mains; the situation might be saved by the split-conductor system. He agreed with the author's conclusions regarding the split-conductor system for feeders; it was new to the public, but over 100 miles of cables and overhead mains were protected by it. On a system of some 50 miles of cable, it operated 40 times in the year, and only once had it failed; on that occasion the system was not to blame, the failure being due to a fault in the mechanical construction.

Mr. A. M. TAYLOR regarded the subject from the point of view of the switch-gear engineer in a municipal undertaking. Referring to the author's conclusions, under (*a*), the remedy which the author gave for the protection of all closed feeder circuits was a split-conductor system, but unfortunately in municipal work that was of no assistance in regard to existing feeders. They had to deal with feeders running from a generating station to numerous sub-stations, in many of which were rotary converters. These feeders were mostly run in triplets, but occasionally in pairs, and sometimes in sets of four, throughout the city, and the author's suggestions in regard to closed feeder circuits, which these were in some cases, did not help them because they could not rip up these feeders and put down split-conductor arrangements. Neither could they throw two existing feeders together under one switch and call them a split-conductor arrangement, because that would have the disadvantage that both feeders would be thrown out of gear for a fault on either of them, and they would be worse off than at present. With reference to the author's arrangement of overload relays, in which the relays operated with the load current plus the fault current, or rather a sub-multiple of it, the author did not mention, except incidentally, the fact that it was not necessary in the case of every fault, say for instance one three-quarters of the way along one of the feeders to the sub-station, that the current to the fault should return *from* the sub-station. In fact it was purely a question of the relation between the load current and the fault current and the potential of the feeder at the point where the earth occurred that determined whether the current should flow back from the sub-station bus-bars to the fault or whether the faulty feeder should carry the load current past the fault on to the sub-station. The author had impressed upon them the desirability of cutting down the amount of fault current by the insertion of a high earthing resistance in order to reduce the shock to the system. To whatever extent they reduced the fault current, to that same extent they made the apparatus unreliable and introduced the possibility of the wrong feeder being pulled out. In fact the system would be the more reliable the bigger the fault current which was allowed to flow. On the other hand, one great virtue of the author's overload interlocked arrangement was the fact that if a short circuit developed between phases on any feeder (or apparatus connected with any feeder) the faulty feeder was instantaneously cut off without waiting for any overload relay to operate. In a case where four parallel trunks ran between two generating stations, that was practically an interconnector consisting of four parallel trunks, he did not see why an arrangement consisting of a core-balancing transformer at each end of the four trunks operating in each case on an independent relay, supplemented by overload relays on each phase of each feeder in the ordinary way as a stand-by, should not be a quite satisfactory solution; it would be very simple because the feeders were already equipped with overload relays and the core-balancing transformers could be added round the feeders without introducing any further element of weakness. It appeared to him that where there were four feeders in parallel, no matter on what part of any of these feeders the fault might occur, there must always be three times the fault current through the sub-station relay on the faulty feeder that there was through the relays on any of the other three, which should sufficiently discriminate between them, the sub-station end of the faulty feeder only being pulled out. Directly this was done the generating station end would follow. Since the arrangement was absolutely reversible it did not matter which was the generating end and which was the sub-station end, the generating end at any instant being always understood to be the one from which energy was most likely to flow to the fault.

Mr. WATERS described a new balancing relay system which permitted T connections to be made off one of two cables; he also described an automatic reverse-current device, with the aid of diagrams.

Mr. A. G. COLLIS said that the author used the term "instantaneous," but actually a relay took 0.4 second to operate, and the switch 0.6 second to open, making a total of one second; hence the circuit was not interrupted until an appreciable rise in the current took place. The author's reverse-current was 180 degrees out of phase; what would be the effect of a current 90 degrees out of phase? It was stated that fuses had no discriminating value, yet they were shown in one of the figures.

Mr. H. BRAZIL inquired as to the cost of the split-conductor cable, and the method of jointing such cables, and referred to the thickness of insulation between the two cores, which might be subjected to a pressure of 6,000-volts in the case of a fault on an 11,000-volt cable. He said it would be difficult to find a fault thus caused between the cores. Referring to overload devices on earthed feeders, which would require an earthing resistance to carry, say, 800 amperes, if a resistance with a negative characteristic were used it could be set at 300 amperes; if the cut-out did not act at once, the current would increase until it attained a sufficient value.

Mr. MURPHY said that reverse-relays had been greatly improved and could be relied upon nowadays; the relay was pretty sure to act before the voltage dropped to zero. The use of reactances in the line gave reverse-relays a better chance to act satisfactorily. The circulating-current system was more complicated than the reverse-current relay, and introduced the risk of shut-down due to breakage of the instrument connections, a matter which was as serious as failure to operate. He described a device for protecting parallel feeders or ring mains in existing networks by using the combined effects of excess current and drop of voltage.

The AUTHOR, replying to the discussion, said that many engineers in the United States were beginning to pay attention to the design of relay systems. The balanced relay was not included in his summary of ideal systems, but had its uses. Where the Merz-Price system could not be employed, the systems described in the paper for protecting parallel feeders afforded the best protection. The system described by Mr. Waters only dealt with faults to earth. In reply to a question put by Mr. Collis, the core-balancing system cleared cable faults with the minimum risk of the arc coming outside the cable. The insulation between conductors was only "light" compared with the full insulation; Mr. Brazil was correct regarding the full star voltage occurring between the cores for a moment. His suggestion of an earthing resistance with a negative coefficient was interesting, but a few seconds was too long to wait. Mr. Murphy's device would require adjustment on site, and re-adjustment after any change in the circuits.

DISCUSSION AT BIRMINGHAM.

The discussion was opened by Mr. A. M. TAYLOR, who dwelt upon the advantages of the split-conductor system as compared with core-balancing systems. In continuing the discussion, Dr. GARRARD pointed out that the Merz-Price system did not protect against bad synchronising but only safeguarded a system against faults to earth. The balanced relay was superior in this particular.

Mr. S. T. ALLEN said that the system under his management was not fitted with any other protective device except the usual inverse time characteristic overload devices. The system contained about twelve miles of E.H.T. feeders, and had operated without any failure or trouble for some years.

Mr. CLOUGH said that he did not think it desirable to have overload devices on generators.

Mr. ORSETTICH objected to the tendency to elaborate protective devices. It was better to work in the direction of so simplifying the systems and machinery that they were robust enough to withstand the consequences of minor faults.

Mr. HOLLIS did not agree with the abuse showered on pilot cables, but thought they were quite satisfactory for many purposes.

Mr. GROVES advocated that more attention should be given to the protection of bus-bars. The devices described in the paper looked after the cables, but left out the bus-bars.

In a written communication Mr. WITCHER thought it desirable to emphasize the distinction between systems which operated on faults to earth and those which operated on faults between phases. He also expressed regret that the author of the paper had not developed the discussion of the split-conductor principle more along the lines of unequal splits.

DISCUSSION AT MANCHESTER.

MR. WELBOURN agreed with the author's conclusions with the exception of (*b*), which was open to argument because, as stated by the author, the core-balancing system appeared to depend on the gamble that the fault would be a fault to earth and not between phases. The recommendations of the author were based on technical grounds, and no comparison of costs was given; this was an element which could not be disregarded. The split-conductor system had some undoubted advantages over the Merz-Price system when dealing with overhead line protection. It was free from the difficulties inseparable from slinging up an insulated cable all along the route, also it was free from having the equivalent of an earthed conductor below the line which could be fouled in the event of a line breakdown. Moreover the split-conductor system had the advantage that on breaking a conductor, the relays would operate and render the overhead wires "dead" long before they could come within reach of the ground.

MR. S. FERGUSON said that there were certain systems where overload devices were used together with a 3-pole high-

resistance earth, and if a fault occurred to earth the overload device was useless; for this reason the two things should be considered jointly. The time limit on leakage devices would appear to destroy some very important advantages of the balanced system, as it had always been said that one important feature of the system was its instantaneous action. Further, the balanced system of protection dealt with a current much less than on overload protection, and if a time limit were introduced, the fault current would be reduced. A remarkable thing about the author's conclusions was that overload did not figure at all, whereas for many years everybody had pinned their faith to overload devices. The system seemed good, but it depended upon the two conductors carrying equal current; if a fault occurred in a sub-station, the inequality was very small. Regarding the protection of open-ended feeder circuits, the balanced system was almost useless if the neutral was not earthed, except in very large systems such as Manchester with a considerable capacity current. Overload protection seemed absolutely necessary in addition to core-balancing. A useful combination which had proved satisfactory was to provide overload protection on two phases to protect against shorts, the remaining phase taking care of the out-of-balance current. The Merz-Price system was unquestionably the best for generators and transformers, although trouble might occur in lock-up sub-stations due to the relays operating on resuming supply after a shut-down.

MR. A. E. MCKENZIE said that in Manchester ten sets of balanced protection gear had been installed without an earthed neutral, and as stated by Mr. Ferguson, the capacity current was quite sufficient to ensure the necessary operation. Unfortunately most stations had their high-tension feeders already laid with no provision for pilot wires for operating Merz-Price gear; in such cases the author's recommendations were to be thoroughly endorsed. He agreed with Mr. Ferguson in condemning time-limit devices on balanced protection, and cited a case where tremendous damage occurred on a feeder protected by overload protective gear with a one-second time limit. Balanced protective devices in series were unnecessary, as the number of faults on a properly-laid cable system did not warrant the expenditure. The Manchester Corporation system had over 150 miles of extra-high-tension cable, and the number of faults per annum was about six. The turbo-alternators and large generators at Stuart Street, Manchester, were protected by Merz-Price gear, fuses being placed in the secondary circuit so that these devices would blow only if a machine was kept on sustained short-circuit or if a fault developed on the machine windings causing current in excess of the normal short-circuit of the machine to be sent in from the other generators. It was therefore quite possible to protect machines against faults on windings or on the main switchboard. Regarding the interlocking of parallel feeders, he had not yet found a satisfactory reverse relay, and consequently where a number of feeders fed a sub-station, it had always been considered advisable to separate the high-tension bus-bars and run as many different sections as possible. The interlocking devices described in the paper were worthy of a trial. In the speaker's experience it had always been found advisable to have a small switch in the secondary circuit of the balanced protective gear, which could be opened temporarily whilst parallelling two feeders going to the same sub-station. No matter how quickly or accurately the switching was done, one phase made contact before the other, and the capacity current caused the relays to operate. His ideal protective gear for generators was Merz-Price balanced protection, with fuses in the secondary, and a device to cut off automatically the field immediately the main switch was opened. Referring to alternator protection, whilst the author's idea of a transformer in one phase was theoretically all right, it seemed more simple to place it on the neutral end of the winding which would probably be outside the casing. This arrangement had been decided upon for the protection of generators in the new Barton Station, Manchester, and consequently there would be no switch-gear between transformers and machines. The machine would generate at 6,500-volts and the transformers step up to 33,000 volts which would go directly through the switch to the main busbars. Merz-Price gear would be installed between the neutral of the outgoing switch and the extra-high-tension transformer. In the event of a fault occurring on either transformer or generator winding, the protective gear would open the main switch and cut the field off the generator. Transformers would be in duplicate so that in case of breakdown, a generating unit would not necessarily go out of commission. The split-conductor system seemed ideal for overhead construction. The speaker thoroughly endorsed the author's recommendations in paragraph (*b*) of his conclusions.

Mr. K. M. FAYE HANSEN said the core-balancing principle was excellent, but should be used in conjunction with an overload device. The biased protective relay was a thoroughly sound practical idea. The author's arrangement of protecting transformers and alternators in series by having two parallel circuits was interesting, and took care of the case where breakdown occurred between different parts of the same machine, which the ordinary Merz-Price arrangement would not protect against. Merz-Price gear should not be used alone for the protection of alternators. Regarding the split-conductor system, since the introduction of concentric cable, the risk of both conductors breaking down to earth was minimised, and the system should have a wide field.

PROF. E. MARCHANT said a very sound maxim was laid down some years ago by Mr. Merz to the effect that no protective device was worth putting in if it led to an increase of risk to the plant which it was designed to protect. The split-conductor system did not lend itself to any criticism from this point of view. If the insulation between the inner and outer conductors was very slight, and a breakdown to earth took place on the outer, it seemed probable that the inner conductor would earth and the split-conductor system would fail to protect. The same applied when two overhead lines were earthed simultaneously.

MR. S. L. PEARCE said that Manchester had an extensive experience of protective systems which could be summarised under four headings. First, any consumer's fault, however severe, should be cleared without upsetting the system. The same remark applied to the regular public supply sub-stations. Thirdly, the feeder at the main generating station should not be brought out except in the event of a fault to earth on any one of the three phases. Lastly, the main generators ought not to be brought off the main bus-bars through any fault on a feeder or on consuming devices, but only in the event of a fault on their own windings. Coupled with this last point was the precaution rightly emphasized by Mr. McKenzie. It was no use taking care to have the generator switched off the main bus-bars if the field was not cut off as quickly as possible. This applied particularly to the present type of machine with forced ventilation. Unless the field was cut off almost instantaneously, the destruction of the generator, whether on the bars or not, was bound to follow. Regarding the Merz-Price and the Merz-Hunter split-conductor systems, the speaker had no experience of the latter, but believed the initial difficulties had been overcome, and it should be the cheaper proposition of the two. The only question was that of jointing, and cable-makers would say that it was not applicable to all voltages and every size of cable decided upon. The only alternative was the Merz-Price. Having regard to the magnitude of the stake, he did not think the relative cost of protective systems ought to be considered. Regarding the protection of duplicate feeders, a new system known as the Ferranti-Waters system seemed to be making headway and was possibly a coming rival to the split-conductor system or the Merz-Price system.

THE AUTHOR in reply said that contrary to the impression of certain speakers, he had stated that he recommended core-balancing devices with overload devices. Regarding instantaneous operation, it was quite practicable to make core-balancing apparatus work in 1/20th second including the time taken by the relay. The cost of the split-conductor system was at present comparable with the Merz-Price, and was bound to come down. Inherently the system was cheaper than the Merz-Price apparatus. Only in the case of the core-balancing leakage device had a time-limit been recommended. The leakage current on a system with the middle point earthed through resistance would represent only a temporary overload on the machine, and did not subject the system to severe shocks. If it was desired to discriminate between individual feeders and consumers' premises, the time-limit core-balancing device on the feeder in conjunction with instantaneous core-balancing devices on the consumers' premises would give the desired result. The split-contact switch was an innovation on purely commercial lines, the net cost of the switch, plus the relatively small transformers required, being much less than in the case of the solid control switch with relatively large transformers. The split-contact switch was not a necessity, but used a much simpler transformer with bar primary. The split-conductor system represented a considerable advance on the results obtainable with the Merz-Price system. It was generally recognised that with the latter on a large system, it was impossible to use settings below normal load current. The methods of attaining the balance in the split-conductor system were so fine that it would trip out on a few amperes and yet be balanced against dead short circuits on a very large system. There were many miles of overhead wire and cable operating on the split conductor system, and for forty faults successfully cleared there was only one failure, which was due to a bad joint and not to any deficiency in design. The automatic field switch referred to by Mr. McKenzie should be made dependent upon the combined action of the device which tripped the switch itself, that is to say, the field switch should not come out immediately the relay operated. On the other hand it should not come out immediately the switch opened, as in that case a machine could not be got off without shutting down. The operating current for core-balancing relays was about 10-amperes, and where a much smaller setting was required the current transformer was of very moderate dimensions. It was quite safe to employ very much less insulation between the two halves of the core than the general insulation of the conductor. At least one case had occurred where both cores were damaged by a pick and the operation of the protective device had not been hindered. The Ferranti-Waters system had introduced some novel and interesting features in relay design. The system actually appeared in the paper under the head of interlocked relays, overload and reverse-current relays and leakage relays. In the author's opinion, interlocked systems were the best methods of dealing with existing cables. In such cases conductors could not be split and frequently Merz-Price pilot wires could not be inserted.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

G.E.C. Ironclad House-Service Set.

It has been the practice in the past in connecting up house service cables to the fuses, to provide a separate sealing trough and pair of ironclad fuses. The GENERAL ELECTRIC CO., LTD., of Witton, Birmingham, have now introduced a self-contained ironclad cut-out set, consisting of a pair of 10-ampere porcelain clad Home Office type cut-outs mounted in a cast-iron case which forms part of the main casting of the sealing trough, this latter being split. Care has been taken to provide every facility for wiring up and fixing; no parts have to be removed for screwing to the board

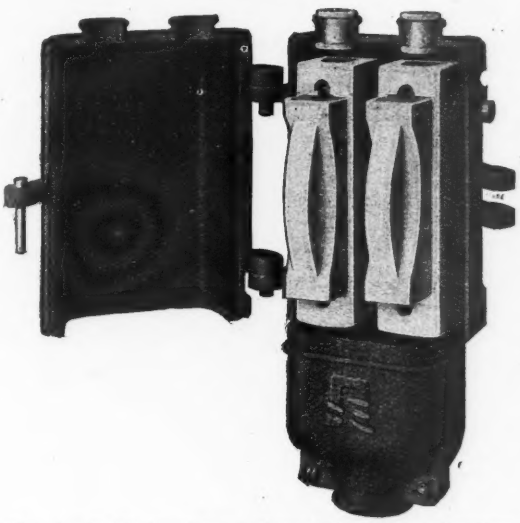


FIG. 1.—G.E.C. 10-AMPERE DOUBLE POLE HOUSE-SERVICE CUT-OUT SET, OPEN.

on which it is mounted, and the cable is taken straight from the sealing trough into the bottom terminals of the porcelain clad fuses. With the cover open it is impossible accidentally to touch any live part. Weighing 5 lb., and having overall dimensions of 9½ in. long × 5¼ in. wide × 3¼ in. deep, the set is far more compact than the usual arrangement, and should find considerable use among supply authorities, especially as it is less costly than the older arrangement. It is available in both side and bottom entry patterns.

Indirect Lighting.

The BRITISH THOMSON-HOUSTON CO., LTD., of Mazda House, 77, Upper Thames Street, E.C., have sent us their new "Eye-Rest" list No. 10 550, from which we note that the system has made such progress, that 40 pages are now required to hold particulars of the many new patterns and adaptations of this system of indirect lighting; whereas the list issued in 1912 described two types of fittings only, the new list contains particulars of about 50 different types. The system depends for its efficiency

FIG. 2.—"EYE-REST" FOUR-LIGHT FITTING.

on X-ray reflectors, which are claimed to be the most efficient reflectors made; the coming of the Mazda "Half-Watt" lamp has naturally had a big effect on the use of "Eye-Rest" lighting, and the new list illustrates and prices a complete range of fittings to accommodate these new lamps. A number of reproductions of "Eye-Rest" installations are shown, taken by the unaided light of the Mazda lamps. To meet the objection held by some people, that the light source cannot be seen, new types have been introduced with the lower half of the bowl made luminous by means of an auxiliary lamp of low candle-power; this translucent part of the bowl can be supplied in a number of pleasing colours. There is also a dining-room pendant type which is supplied to meet the need for the conventional silk shade fitting, with a small lamp and reflector to illuminate the table and silk shade.

A special hospital fitting has been designed, with a glass cover, to keep out dust and reduce cleaning to a minimum. Another adaptation of the "Eye-Rest" system is its application in flambeau form, with from two to six flambeaux; an ingenious connection box for wiring forms part of the decoration.

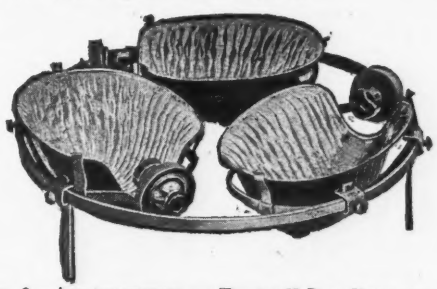


FIG. 3.—ARRANGEMENT OF THREE X-RAY REFLECTORS.

The system has been applied to portable standards, for floor or table use. There is also illustrated a very clever pull switch for fixing to "Eye-Rest" bowls containing a number of lamps, operated by a ball chain hanging from the centre. In some cases the fitting has to be lowered for cleaning, and a two-contact gear with a pulley is shown for this purpose. Illumination data with regard to "Eye-Rest" lighting are given, and there are tables showing the watts per sq. ft. for different classes of installations, and the length of drop required for various sizes of rooms, according to which particular type of X-ray reflector is used.

We illustrate, in fig. 2, a four-light fitting, and in fig. 3 the internal arrangement of the reflectors of a three-light fitting.

The County Lantern.

We have received from the GENERAL ELECTRIC CO., LTD., of 67, Queen Victoria Street, E.C., particulars of the County half-watt street lighting lantern. This is provided with a Holophane globe and the distribution curve, fig. 4, taken with a 200-watt Osram half-watt lamp, gives a remarkably wide angle of illumination.

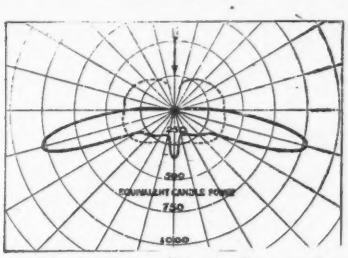


FIG. 4.—DISTRIBUTION CURVE, COUNTY LANTERN.

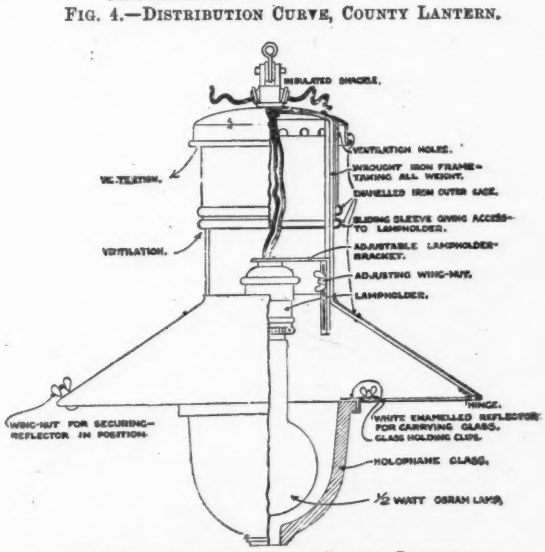


FIG. 5.—SECTIONAL VIEW, COUNTY LANTERN.

Two interesting features are a sliding sleeve, giving free access to the lampholder, and an adjustable bracket to which the holder is attached, enabling perfect accuracy of focusing to be obtained these points are clearly shown in fig. 5.

The lantern is finished in either vitreous enamelled or stove Japanned iron.

We may remind our readers that the company has an illuminating engineering department, specially to advise on the carrying out of illumination schemes of all kinds.

LEGAL.

WORKMEN'S COMPENSATION.

ON January 6th, in the West London County Court, application was made to his Honour, Sir W. Lucius Selfe, sitting with the Medical Referee, for an award under the Workmen's Compensation Act in favour of W. H. Daniell, living with his parents at 21, Glenrose Street, Fulham, an apprentice with Messrs. Marryatt and Macnaught, Ltd., electrical engineers, Askew Works, Shepherd's Bush, who were respondents. On behalf of the latter, Mr. W. Shakespeare, barrister, submitted that the injury on which the applicant relied did not arise out of his employment.

The facts stated were that on the 18th May last, Daniells went into the employ of the company at 4s. 6d. a week. He worked on till June 6th, when one of the other apprentices was showing him what a lathe was used for. To illustrate this he fastened a spanner in the chuck and then turned the belt on to the driving pulley. This was running at 1,400 revolutions per minute, and the result was that the spanner flew out and struck Daniells in the left eye, which was completely destroyed. Applicant gave evidence to this effect, and in cross-examination stated that he was not aware of the rule in the works that he should not speak to others while at work, and that when he wanted to know anything he should ask the manager or the foreman. Brooks, an apprentice working on a lathe next to Daniells, said that he frequently showed applicant the working of the lathe. To show him that only round articles could be turned in the lathe, he put in a spanner and fixed it in the clutch. Then he switched on the belt, which he thought was on the slow pulley, but it was in fact at top speed—1,400 revolutions a minute. The spanner flew out and caught Daniells in the left eye. His Honour held that the boy had been hurt while in the course of his employment, and seeing that the medical referee stated that he was again fit for work, awarded him 4s. 4d. per week from June 6th till date, with costs.

PLUTTE, SCHEELE & CO., LTD., *v.* HUDSON, SHEED & TOWELL, LTD.

IN the City of London Court, on Friday, Messrs Plutte, Scheele and Co., Ltd., electrical accessories manufacturers, 18-19, Queenhithe, sought to recover £4 12s. 4d. for electrical accessories supplied to Messrs. Hudson, Sheed & Towell, Ltd., art metal workers, 9, Newman Street, Oxford Street.

MR. PEARCE, plaintiffs' solicitor, said that the defendants admitted owing the debt; but they would not pay it on the ground that plaintiffs were alien enemies. Plaintiff company was registered in England and carried on business in London. That was sufficient to enable the plaintiffs to recover.

Defendants' representative told the Court that the plaintiffs were alien enemies, and for that reason they did not want to pay the money to anyone who was fighting the country.

JUDGE RENTOUL: That is most patriotic.

MR. PEARCE observed that the money would be paid to Englishmen. The majority of the shareholders were naturalised Englishmen.

MR. JONES, plaintiffs' sales manager, said there were four or five shareholders. The plaintiffs were before the Court in August, when the Court ordered money to be released in their favour in other litigation.

Defendants' representative added that the goods were supplied in June and July. At Somerset House they found that Alexander Plutte and his wife held £4,765 shares and F. Plutte held £845. Both the Pluttes had gone to Germany to fight England.

MR. JONES said that E. Plutte had left the country, but F. Plutte, the founder of the company, was a naturalised British subject and was in London.

JUDGE RENTOUL: Naturalised!

MR. PEARCE said that the plaintiffs would undertake not to part with the money to Germans.

Defendants' representative said that the two Germans who had fled the country were both directors of the company as well as shareholders.

JUDGE RENTOUL: They will do no harm now that they are away.

Defendants' representative: But they remain shareholders.

JUDGE RENTOUL: His Majesty has a first cousin, and we do not know how things are mixed up. There must be judgment for the plaintiffs with costs.

A MOTOR-CYCLIST'S CLAIM.

INTIMATION has been made in the Court of Session of the settlement of the action by a Glasgow manufacturer, against the British Thomson-Houston Co., Ltd, Glasgow, and the District Committee of the Middle Ward of Lanarkshire, for £500. Pursuer, while riding a motor-cycle, ran into a heap of road metal and tarmacadam and sustained serious injuries. The British Thomson-Houston Co., Ltd., were laying a tramway in the neighbourhood. Pursuer has accepted a tender of £300 and expenses.

DOUGLAS *v.* PELICAN.

IN the Shoreditch County Court, last week, before his Honour Judge Cluer, Benjamin Douglas, of Hackney, an electrician and decorator, sued Harry Pelican, of Stratford, to recover £6 for work done and wages. Plaintiff's case was that he had electrical work, &c., to do, to the amount of £13, and had received £9. He claimed the balance of £4 and £2 for a week's work at Stratford. When he asked for his money, he got a complaint that the work at Stratford was not carried out properly, but that was untrue. He was laid up for a week after working at Stratford, and when he returned he was refused employment. It was the electric light wiring that he was told was complained of. It was untrue, he said, that a Borough Council inspector came to the place and condemned the work, because it was not covered with insulated tubing in accordance with the Board of Trade regulations. Plaintiff said he had asked the defendant for more tubing, but was refused it on the ground that he had sufficient. It was true that an account was opened in his name with a firm for the supply of tubing by the defendant, but he denied that he could have ordered what he liked. Plaintiff positively denied that he saw the officer of the West Ham Council more than once, and then no complaint was made as to the work. Since that time he had done other work which had been passed by the Council officer. The officer never said anything about it being dangerous to life and limb, or that it would have to be covered with Simplex tubing. The defence was that the work had not been carried out properly, and would cost a lot to put right. Judge Cluer upheld that view, and gave a verdict for the defendant with costs.

NEW PATENTS APPLIED FOR, 1915.

(NOT YET PUBLISHED).

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

27. "Electrolysis." F. W. GAUNTLETT. January 1st.

55. "Apparatus for supplying alternating current from a direct-current electric battery." E. C. IRVING & S. L. GLENN. January 1st.

58. "Means for the electrical transmission and distant control of movements, specially applicable to systems for signalling orders and the like." E. A. GRAHAM & W. J. RICKETS. January 1st. (Addition to 6,214/14.) (Complete.)

81. "Electric couplings." J. S. HECHT. January 2nd.

82. "Electric-current modulators, more particularly for microphones, electric vibrators, and the like. F. MORANO. January 2nd. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford, price, post free, 9d. (in stamps).

1913.

21,445. SAFETY APPARATUS FOR ELECTRIC LIGHTING INSTALLATIONS. Soc. Anon. des Automobiles and Cycles Peugeot. September 23rd. (December 17th, 1912.)

23,514. "AHEAD" OR "ASTERN" INDICATOR FOR MARINE ENGINES. C. Edington. April 17th, 1914. (April 17th, 1914.)

23,897. HOT PLATES AND THE LIKE ELECTRICAL HEATING DEVICES. G. Cooper. October 22nd.

24,163. ALIGHTING INDICATORS FOR FLYING-BOATS OR OTHER AERIAL CRAFT. N. P. Billing. October 24th.

25,720. TELEPHONE SYSTEMS. M. Suwa. November 10th.

28,746. TERMINAL PIECES AND CONTACTS FOR ELECTRIC CIRCUIT INTERRUPTERS. F. B. Holt. December 12th. (June 5th, 1914.)

28,839. HIGH-FREQUENCY ELECTRIC CURRENT GENERATORS. P. O. Pedersen. December 13th. (December 19th, 1912.)

28,854. ELECTRIC CONDUIT FITTINGS. R. W. Perry. December 15th.

28,935. ELECTRIC GLOW LAMPS AND METHODS OF MANUFACTURING SAME. C. O. Bastian. December 15th.

28,939. APPARATUS FOR PERFORATING TAPE FOR THE AUTOMATIC TRANSMISSION OF TELEGRAPH SIGNALS AND FOR OTHER LIKE PURPOSES. Eastern Telegraph Co., A. Fraser, & K. L. Wood. December 15th.

29,260. ELECTRICALLY-INSULATED FISHJOINTS FOR RAILWAY RAILS. W. R. Sykes. Interlocking Signal Co. & G. H. Sykes. December 18th.

1914.

341. REVERSIBLE ELECTRIC MOTORS. G. W. Warnholz, F. M. Spencer, & W. J. Wigmore. Jan. 6th.

557. ELECTRIC TERMINALS. Western Electric Co. (F. T. Woodward, acting for Western Electric Co.). January 8th.

3,587. INDICATING-APPLIANCES FOR ELECTRIC-MEASURING INSTRUMENTS. L. C. Benton. February 11th.

5,360. ELECTRICAL SWITCHES. B. O. Horton. March 2nd.

8,042. VAPOUR ELECTRIC DEVICES. British Thomson-Houston Co. (General Electric Co.). March 30th.

9,104. MAGNETOS FOR MOTOR-CYCLES. A. Garelli. April 9th.

10,841. MINING BELLS. W. A. Heyes & L. O. Heyes. May 2nd.

10,898. ELECTRIC SALE APPARATUS. L. J. J. Van der Hoorn & S. Wouda. May 2nd.

11,214. MANUFACTURE OF ILLUMINATING GLASS. G. A. Mackbeth. May 6th. (May 9th, 1913.)

11,491. SIGNAL SYSTEMS. F. H. Webster. May 9th.

11,996. ELECTRICALLY-HEATED BOILING-PLATES AND THE LIKE. G. Pate & A. R. Wood. May 15th.

13,605. SPARK PLUGS. S. C. Stockdale. June 4th.

17,597. PACKING ENVELOPES AND CASES FOR ELECTRIC BATTERIES AND CELLS. G. F. Hitzelberger & New British Ever-Ready Co. July 24th.

18,244. STORAGE-BATTERY PLATES. M. Krokavetz. August 1st.

18,258. DYNAMO-ELECTRIC MACHINES HAVING ROTARY FIELD MAGNETS. W. P. Thompson. (Aktiebolaget Ljungstroms Angturbin.) August 7th.